LINCOLN COLLEGE

(Canterbury Agricultural College)

UNIVERSITY OF NEW ZEALAND

The Proceedings *of the* Lincoln College Farmers' Conference 1955

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A Canterbury Agricultural College Publication

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of the
Lincoln College
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Men are never so likely to settle a question rightly as when they discuss it freely.

—*Macaulay.*

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LINCOLN COLLEGE FARMERS' CONFERENCE 1955

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Committee:

Messrs S. C. Bowmar, Gore.

L. P. Chapman, Mt. Somers.

J. H. Grigg, Longbeach, Ashburton.

A. Henderson, South Hillend R.D., Winton.

John Hunt, P.B. Cromwell (Chairman).

A. C. Hurst, Papakaio.

J. R. Little, Hui Hui, Hawarden.

T. A. McKellar, Pigeon Bay, Banks Peninsula.

G. S. Slater, Hilton.

D. S. Studholme, Coldstream, Ashburton.

M. B. Turton, Ashburton Forks.

Dr M. M. Burns, Lincoln College, Christchurch.

Hon. Secretary,
L. W. McCaskill,
Lincoln College,
Christchurch.

PROGRAMME

18, 19, 20 MAY, 1955

OFFICIAL OPENING

The Chairman, Mr J. S. Hunt, was the first to address the members of the fifth Lincoln College Farmers' Conference. He stressed the very urgent need for still higher production to meet the steady increase in population. He continued by praising the progress already made in response to research on the easier land but warned farmers to pay more attention to production costs. "We know on the low country that if we do a certain job in a certain way we will get a certain result, and we know how to get high producing pastures on our second class browntop foothill country," he said, "but the high country development is lagging far behind." Mr Hunt deplored the attitude that all land over 2,500 feet should be unstocked and felt that the need for high country research was very pressing and could bring about substantial gains. Mr Hunt concluded by asking the Hon. Minister on behalf of the farmers of New Zealand for some assurance about superphosphate supplies, meat storage space, irrigation projects for Otago and the establishment of a Veterinary School.

Dr Burns, the Director of the College, expressed the College's pleasure at being able to accommodate, for the first time, all those farmers who wished to attend instead of as in the past a representative group from each area. "Today we gather in the spacious new Refectory and it is with very special pleasure that we extend to you all a warm welcome. We of the College staff look forward to these Conferences for at them we meet so many friends who provide real stimulation for continued research and who keep us up-to-date on the problems and developments of the whole South Island. The programme arranged by the Conference Committee is an excellent one and I am sure that you can look forward to three days of a judicious blend of scientific and practical papers followed by lively discussion which will enrich your knowledge and broaden your horizons." Dr Burns drew the Conference's attention to the display of the effects of stock damage to hide value exhibited by two commercial firms in the woolroom.

Mr W. H. Gillespie, M.P., Chairman of the Board of Governors, followed and gave the address of welcome. "It is my privilege and very great pleasure to extend to our Deputy Prime Minister and Minister of Agriculture, the Rt. Hon. K. J. Holyoake, a very cordial welcome. It is indeed fitting that we should have him here to open this Farmers' Conference." Mr Gillespie went on to welcome the members of the Conference and expressed his pleasure that they were able to use the magnificent new hall, which he explained was part of the College development programme—the repercussions of which he was sure would greatly benefit the College and therefore New Zealand agriculture as a whole. He concluded by saying that he hoped that Lincoln College would continue to play its important role in the direction and general well being of the farming community. "I extend you a very cordial welcome and trust that your Conference will be a very successful one, as the past conferences have been, and I wish you well with your deliberations."

Rt. Hon. K. J. Holyoake, Minister of Agriculture: First of all I should like to express my appreciation of the honour which was done me in inviting me to come to this function and to express the best wishes of the whole Cabinet, particularly of the Prime Minister and

Mr Algie. Unfortunately I was not able to attend the 75th Anniversary celebrations so I shall say now that I was astounded and gratified to learn that Lincoln College was the third School of Agriculture to be established in the whole of the British Commonwealth.

This College has made a splendid contribution to farming and the whole economy of New Zealand. Its graduates include 3,000 holders of the Diploma of Agriculture and over 200 degree men. Of the farmers the most prominent are named in the Bledisloe Medal list, which includes: H. A. Knight, Racecourse Hill, who at one time grew 2,000 acres of wheat; J. M. Ranstead and G. Rennie of Waikato, and J. R. Lloyd Hammond, Marton, for their dairy development; H. J. Andrew, North Otago, R. J. Low, Methven, W. A. Yardley, Otago, who were leading sheep breeders; E. M. Beamish, Hastings, G. W. R. Osborne, Leeston, A. B. Martin, Martinborough, who are well known for their land development; A. Briscoe Moore, Whangarei, for land development and service on the Meat and Wool Board; and A. T. Carroll who was a leader of the Maori race and outstanding farmer. All these men can be said to have had an impact on farming thought and progress in their districts.

Of Bledisloe Medallists who have served the farm community in technical matters, brief mention could be made of the work of A. W. Hudson, who developed field experimentation for the Department of Agriculture; P. W. Smallfield, Director, Extension Division, Department of Agriculture, who developed land reclamation schemes of Rotorua, Waikato and North Auckland; P. G. Stevens for progress in animal husbandry, especially pig recording and merit sire scheme in sheep; R. A. Calder, former Director, Crop Research Division, and many others.

The College has been fortunate in its Directors and staff. Such men as W. E. Ivey, J. Bayne, W. Lowrie, R. E. Alexander, F. W. Hilgendorf, and M. J. Scott have all made contributions to agriculture although I have not time to describe them individually. However, I feel I should mention E. R. Hudson (1936-1952) in whose time the College farm reached a high stage of development. He developed high-producing ryegrass-clover pastures and made clear the meaning of soil fertility. His introduction of subterranean clover in the economy of Ashley Dene was classical work on development of Canterbury dry plains. The staff under Hudson also made distinctive contributions to the solution of farming problems of crop and animal diseases, animal nutrition and breeding, farm economics, and agricultural advisory work. In recent years the College has worked in with State agricultural organisations and the happy liaison with the Department of Agriculture and the Department of Scientific and Industrial Research augurs well for the future, although I do not feel that farmers as a whole appreciate fully the work being done by research workers in an endeavour to help our primary production.

I, as Minister of Agriculture, welcome such Conferences as this and also the increasing tendency in recent years for organised periodical visits of farmers to establishments such as this, to discuss the agricultural progress and research. It is a great thing to be able to get together and discuss our various problems.

Regarding the future, I would like to think that, just as aerial topdressing has opened up a new horizon on much of our problem hill country, so in the not too distant future the tide of deterioration in the high country will be turned into a new era of improvement. With the ever increasing knowledge of plant and animal relationships possessed both by the users of the high country and by research workers, a time must come when today's problems will be overcome.

If any worthwhile increase in production is to come from the vast area of low rainfall country in Otago and Canterbury then irrigation is essential. This has been recognised by the Government in the setting up of a Standing Interdepartmental Committee on irrigation in Wellington to advise the Government on policy matters and to report on proposed new irrigation schemes; and local Interdepartmental Committees in Christchurch and Dunedin to examine proposals submitted by groups of farmers through local District Commissioners of Works. The Government has set up the machinery for sympathetic and expeditious consideration of any new irrigation schemes, which by the announcement of Government policy early this year has thrown the initiative in the establishment of new irrigation schemes or extension of existing schemes over to the farmers themselves.

The possibilities of dairying on Canterbury light lands under irrigation have been conclusively proved on the dairy farm unit and serious consideration is being given to the starting of work on beef production under irrigation. I have myself farmed under irrigation in the Nelson province and know what a tremendous asset water is under these conditions.

The New Zealand farmers are among the best farmers in the world, and I feel that this College by enabling farmers to attend Conferences and short courses has in no small way helped to bring agricultural education to achieve this position.

I hope that in retrospect the memory of the Conference, for farmer and research worker alike, will not be of the sleep lost but of the knowledge gained, the fellowship and good will created, and the understanding reached of your respective problems.

WOOL AND ITS PRODUCTION IN THE SOUTH ISLAND

1. NEW ZEALAND WOOL BOARD AND ITS POLICY

Mr W. Horrobin, Chairman of the Wool Board.

(Read by Mr B. S. Trolove)

The Wool Board which was established in January, 1945, took over the functions of the Wool Council which was set up in December, 1936. This Council, composed of representatives from the wool growers of New Zealand along with representatives of the wool growers of Australia and South Africa, held their first conference in Melbourne in 1937 when it was decided to establish the International Wool Secretariat to undertake the work of world-wide publicity, promotion and scientific research. The vision shown in laying the foundation of this world organisation as we know it today has been amply justified in the success of the Secretariat's activities in sixteen countries.

The Wool Board is an elected body comprising six representatives of the wool growers, two members who are appointed by the Government (and who are at present both wool growers) and the Director-General of Agriculture as associate member.

Before dealing with the Board and its activities in New Zealand I propose to give you a short history of the growth of the International Wool Secretariat. The Secretariat was established and commenced its activities in July, 1937. Each of the three Dominions—Australia, New Zealand and South Africa—appointed its own representative and the foundation was laid in the first two years for the present large-scale publicity, promotion and scientific research departments, with headquarters in London. This work was checked by the outbreak of war in 1939, but despite many difficulties work proceeded with the development of the ideas laid down at the Melbourne conference.

Representation in France and the United States having been established at the commencement of operations, the first moves after the war were, in 1947, to open offices in these two countries, and later in the same year in Belgium and Italy. From this period the expansion was more rapid and offices were established in Canada, Sweden, Holland, Switzerland in 1948, in India, Denmark and Norway in 1949, Germany in 1951 and the last office to be opened was in Japan in 1953.

In the United States the International Wool Secretariat at the beginning was carrying on similar work to that of the American Wool Council, the body representing the wool growers of that country. In 1949 it was agreed by the two bodies to establish an organisation known as the Wool Bureau, Incorporated, and a common publicity and promotion front was established by the wool growers of New Zealand, Australia and South Africa with the wool growers of the United States. This section of our activities is controlled by a Board of Directors representing the American Wool Council and the Executive of the International Wool Publicity and Research Fund—this Board of Directors is largely composed of wool growers.

With the growth and expansion of the Secretariat there has been a steady increase in expenditure from the original budget of £50,000

to the budget for the present year of approximately one million pounds. In consolidating this work a "goodwill" has been steadily built up with all sections of the wool industry and, during the last four years, active and financial co-operation has been forthcoming from manufacturers, distributors and retailers in all countries where offices have been established. At the end of this year it is anticipated that the trade will have contributed nearly £500,000 for joint wool promotion activity in various countries.

These are only the basic facts regarding the building of the organisation that we know today and it can be traced mainly to the foresight of those attending the Conference in Melbourne in 1937.

So far as the Board's work in New Zealand is concerned we have our three main functions of wool publicity, promotion and scientific research; with active interests in shearing instruction and the industry's needs in general.

The publicity and promotion sections are very closely related and have been expanded steadily since the Board was established. It is now recognised as the principal source in New Zealand for information concerning the wool industry and its activities. The Board has the advantage of being able to draw on the International Wool Secretariat, London, the Wool Bureau, North America, and the Boards of Australia and South Africa for a wide range of educational, promotional, economic and industrial material to meet the ever-increasing demand for information about wool from the sheep's back to the finished fabric.

The function of the Board's propaganda is to inform, educate, and to carry out promotion at the retail level. Regular news and information services are provided to wool producers, editors, leader-writers and broadcasting stations. At the same time the Board is called on to provide special articles, prepare and deliver radio scripts and supply statistics relating to the industry.

In the educational field a large volume of material is distributed to training colleges and schools. The value of this work is that teachers and pupils are supplied with wholly reliable and attractively-produced material, dealing graphically with the conditions under which wool is produced, its effect on the country's standard of living and the importance of the sheep and wool industry in New Zealand's and the Empire's economy. Another feature of the educational work is that lectures are given to retail store staffs—usually in conjunction with displays arranged in a particular store—and talks to women's organisations. This year our promotional efforts are being concentrated on "Wool Weeks" in a number of centres and support from the retail trade, manufacturers, Chambers of Commerce and City Councils, has been readily forthcoming.

The Board's Shearing Instruction Service, now in its second year, has considerably expanded its activities. To carry the "Bowen technique" of shearing into the provinces on a continuous basis, twenty-five selected shearers were given a week's intensive training in this technique last August, and have been giving shearing tuition in nearly all provinces as part-time Wool Board employees and under the direction of the Meat and Wool Sections of Federated Farmers. At the same time some extensive tuition has been given at the two Agricultural Colleges to courses of learner shearers under the personal supervision of Mr Bowen and one full-time assistant. The popularity of these College courses has been shown by the waiting lists of trainees held by each Province. An average of fifteen are instructed in each two weeks' course and plans are under way to grade future courses according to the abilities of the men offering for them.

In the field of scientific research the Board is contributing to

projects both in New Zealand and overseas. The major portion of the funds expended on research is channelled through the International Wool Secretariat and, last year, our share of that expenditure was £20,252. The total amount expended by the International Wool Secretariat overseas was £87,671 and, while we contribute the figure mentioned earlier (£20,252), we receive the active benefit from the total amount spent by the three Wool Boards.

In New Zealand our expenditure in research is £12,438. This figure refers only to funds allocated to sheep and wool problems which are under investigation at Massey and Lincoln Colleges, by the Gisborne Veterinary Club and by the Woollen Mills' Research Association in Dunedin.

For some years the Board has provided bursaries to selected graduates for further studies overseas and a grant has been made to Lincoln College for two projects associated with wool growth under the direction of Dr Henderson, and a grant to Massey College for two sheep breeding projects directed by Professor Rae, both these gentlemen studied overseas under bursaries from the Board. Dr D. A. Ross, another bursar, has just completed his course at Leeds University, having studied under Professor Speakman. Mr R. L. Averill is continuing his studies on fertility in sheep at Cambridge University under Dr John Hammond.

Apart from Doctors Henderson, Rae and Ross, two other former Wool Board bursary holders are working in New Zealand, directly applying their post-graduate knowledge to wool industry problems. They are Dr D. G. Edgar, of the Ruakura Animal Research Station, and Mr B. P. Philpott, who is working as a statistician with the Meat and Wool Boards' Economic Service in Christchurch. It is the Board's desire to see the expert services of its bursars actively utilised on behalf of the Dominion's wool industry and, by the granting of money for specific research projects at the two Colleges, it has ensured that two, at least, of its bursars, are able to do so.

The Board's participation in the animal husbandry side of the industry is extended by its seat on the Veterinary Services Council, its membership of the New Zealand Woollen Mills' Research Association, its joint participation with the Meat Board in the Economic Service, and its membership of the New Zealand Wool Commission.

In the immediate post-war years the Board was closely concerned with the disposal of the war-time accumulations of commandeered wool and its attention was fixed on post-war developments in joint disposal proposals. The two important matters—the establishment of the International Wool Secretariat on a firm, business-like footing and discussions concerning post-war marketing—had to be resolved.

While the Board's function in no way enters into conflict with the other fibres it is ever mindful of the threat which they could become to wool should we let up in our endeavours to both promote and publicise our quality commodity which has no equivalent substitute.

The policy and functions of the New Zealand Wool Board are defined in the Wool Industry Act, 1944, which with minor amendments, is the Statute under which the Board operates.

The six specific responsibilities briefly are:

To promote the use of New Zealand wool, in existing or new markets, by publicity.

To promote by way of subsidy or otherwise, scientific or industrial researches in relation to sheep and wool.

To act in combination or association with any body having similar functions, whether established in any other part of Her Majesty's Dominions or elsewhere.

To exercise such functions in relation to the production, handling, pooling, appraising, storage, distribution, marketing and disposal of wool as may be conferred on the Board.

To advise the Government in relation to all or any of the foregoing matters.

To act in combination or association with the Meat Board and the Dairy Board in carrying out or assisting any project that may be considered by the Board directly or indirectly to benefit the wool production industry.

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2. THE WOOL TRADE

Mr J. Boyd-Clark, Christchurch.

It is with a great deal of pleasure that I am able to join you here today at this Conference and pass forward a few remarks on the wool trade. While I realise fully that this is a great privilege, I do want to stress the point that anything I say is purely my own view and not necessarily the view of other members of the wool trade in this country.

It is impossible to discuss the subject without first having a brief look at the historical background of the industry and its importance to the commercial world since the earliest days. Wool is the oldest known texture used for clothing and other purposes. In the Chaldean Tablet, which was found in Persia and is the oldest Bill of Sale extant, wool is the principal item mentioned. This tablet is judged to have been drawn 4,000 years B.C. The first animal mentioned in the Bible is the sheep, and the King of Moab paid tribute to the Israelites with 100,000 fleeces and 100,000 lambs. It is even possible that wool fabrics were exported from England in the eighth century, for Britain's earliest commercial treaty, the famous letter of Charles the Great to Offa, King of Mercia, in the year 794, contains this passage, "Our subjects make request concerning the size of the cloaks—that you make them of the same pattern that used to come to us in old time."

Although weaving was practised in England from the earliest times, the cloth trade was not really important before 1300. Henry II in the 12th century imposed a tax on wool for the building of London Bridge, in fact to a large extent, wool was used as currency. In 1340, instead of a grant of money to Edward III, Parliament granted him 30,000 sacks of wool.

The largest and most important flockmasters in the early days in Britain were the Cistercian monks, and the Yorkshire Abbeys were the principal sources of supply. A peculiarity was the tendency to standardise the production from year to year, and the trading record of the Abbeys was, over all, a rather sorry one.

It is not generally known that the wool trade is largely responsible for the evolution of Britain's taxation system. The monasteries were required to pay a whole year's wool clip to ransom Richard Coeur de Lion from imprisonment in Austria. Then on his return he advised them that he had received monies for the next year's clip also, which monies of course he never paid out. Probably that was the first lesson, unheeded, of the failure of Government to Government or controlled marketing.

Taxation in England was systemised in the 13th century and for threequarters of that century the export of wool was taxed so

heavily, three taxes one on top of the other, that the trade was almost ruined. Later, however, sheepfarming became so profitable that all other branches of agriculture suffered, and Henry VIII had to enact a law restricting the number of sheep that any one person could own to 2,000.

So much for the past; now what about more recent times, and the more localised viewpoint?

Few non-farming people realise the increase in the marketing of New Zealand wools in the local auctions. In the 1925-35 period the offerings in this country were averaging around 500,000 bales per year, whereas since the war the figure has been around 900,000 bales per year. Various factors may be said to be responsible for this change, including increased production, the fact that during the war period all wools were sold in New Zealand, and also the cutting up of larger properties and the consequent increase in the number of smaller clips makes New Zealand selling more advantageous in many cases. From the wool trade angle, this development has meant far more than just increased wool sales; it has, along with the natural "growing up" of the country brought with it much greater responsibilities such as in finance and transport.

Wool is the only important commodity produced in this country that is sold at public auction and which is open to the buyers from all and every using country in the world. It is almost the last remaining primary product in New Zealand that is open to this free and wide competition, and apart from the periods of the two world wars, has been sold in this way for over 50 years. A glance at the list of wool exports will show that in the past twelve months New Zealand wool has been exported direct to 32 different countries, including, apart from the larger buyers, South Africa, South America, Spain, Korea, Mexico, Egypt and Algeria.

Prior to World War I the bulk of the export trade was in very narrow channels. For instance, United Kingdom buyers would receive orders, along with a credit already established and would be able to ship and draw against those credits on prompt day. The merchant or importer at the United Kingdom end would or could, in turn, divert his purchases wherever he pleased and would in many cases finance the wools for varying periods, taking all the accompanying responsibility. Today, however, that financial responsibility is very largely domiciled here in New Zealand, part of that "growing up" process already mentioned.

The world-wide tendency, from the bottom to the top of our economic system, to call for and demand economic security through the means of guaranteed prices, guaranteed wages, guaranteed costs, guaranteed everything, is gradually narrowing down the margin which created the incentive toward better production. Heavy taxation has been partly both the cause and the increasing effect of this condition, and let us hope it will not again ruin the industry as it did in the 13th century. In the textile trade this demand for security has shown itself in the tendency by manufacturers and processors to depart from the old system of backing their individual judgment of market tendencies and requirements, and to rely more on "firm offers" from the point of origin, which they can either accept or reject according to the business available.

As you no doubt are aware, the three main factors in wool valuing are (a) quality, (b) style and colour, (c) yield, followed by length, soundness and handle. All these factors vary from clip to clip, year by year, according to the climatic conditions and the knowledge and efficiency or otherwise of the individual farmer. By the same token,

hardly any two users can be said to have exactly the same requirements, their machinery, technique, and the ultimate usage making variations in demand that have to be translated by the buyer here when valuing. Today, the customary method of sending orders to this market is on a "clean CIF & E" basis, that is, the actual cost of the clean fibre delivered to the user's plant, and in most cases today the yield guaranteed to within one per cent. Variations in exchange rates, discount rates, interest rates, freight rates, have all to be considered when arriving at the greasy price to be paid in the saleroom.

According to recently published figures, the wool textile industries of the world are now using more than half their consumption in fibres other than wool. Man-made fibres can be made to suit any requirement and are not subject to seasonal or climatic effects on physical characteristics. These fibres now have a large place in the market, particularly on cost and price structure, in clothing, blankets, floor coverings, and similar products.

Thus, it is becoming more and more essential for wool to be given more thought and consideration by the producer. The main thing is good get-up and good presentation—near enough is not good enough. I would hesitate to tell farmers how to do their job, but if you were on our side of the fence, I am sure you would not be quiet for very long. For instance skirting: this does not mean tearing off the nearest third of a fleece; it means what it says—taking off the heavy fribbley pieces all round the fleece. If you have two or three odd fleeces that are away different from the rest—do not throw them into the main lines just because they are only few in number—send them to the broker for binning. We all know that the man over the fence has poorer sheep, does not bother about skirting and classing, and still gets more than the careful farmer—that has been the story ever since the wool trade started, but you all know how much real truth there is in it.

Now I would like to express a few personal thoughts on what could be done for the future. Here I must say that I am not attacking the farmer, and I am not attacking any of his organisations, but merely trying to think aloud in what I hope is a constructive manner. You have a report on the activities of the Wool Board. This is an example of the farmers getting together, and supporting with a large sum of money, a scheme to promote their interests.

However, speaking in a setting such as we are in today, gives me, personally, food for thought as to the expenditure of these, or should I say your monies. Looking at the Income and Expenditure Account for the year ending June 30, 1954, of the New Zealand Wool Board we find that from an income of over £241,000 over £229,000 is spent overseas in wool promotion. A large part of this is spent in publicity work on manufactured woollen goods—do you find, for instance, the United States Steel Corporation spending hundreds of thousands advertising motor cars which contain their steel? My point is this —right here in this College the sheepfarmer of New Zealand has the greatest asset that he could find in any country in the world. With its geographical position Lincoln College, with every type of sheep and sheepraising country within arm's reach is better situated than any other college in the world for sheep and wool research. Just imagine what could be done, what benefits gained, not only for New Zealand farmers, but for woolgrowers everywhere if even 10 per cent of the Wool Board income was spent in sheep and wool research right here at Lincoln. It could put New Zealand as a leader for the whole world in wool production and get-up, a position other producing countries would give everything to attain.

Mr Hunt, Chairman: With reference to wool prices established by the Board, would Mr Trolove tell us if the Board purchased any wool during the last season and would it be possible for him to tell us the funds still available to the Board to maintain the price?

Mr Trolove: The Wool Board confer with the Wool Commission, but it is largely the Commission who sort out and fix the prices. Twenty-six and a half pence is very low when compared with market prices, but the floor price is fixed to keep the grower afloat and functioning during a period of steep recession of prices, until such time as costs also fall, or the market recovers.

At present there are £27½ million in the Wool Commission pool. Increases have been made at the rate of approximately £800,000 per year, but it is generally considered that at the present level of production £27½ million is sufficient. Some of the interest on this money has been used for the benefit of the industry. The manner in which it is used is subject to the approval of the Minister and the Wool Board. This season half the levy—or 2/6 per bale—has been derived from this fund. It is agreed that the pool shall build up from the interest if there is an increase in production.

Mr Matheson, North Otago: What work is being done on developing the snow comb?

Mr Trolove: A new cutter is in preparation and will eventually be marketed. The Wool Board is not actually sponsoring the snow comb but it is well aware of its importance. There is a definite lack of experienced blade shearers and very few learners have come forward.

Mr Grant, Waimate: Is the £27 millions held in bonds?

Mr Trolove: The money is held as long and short term bonds and a proportion of the funds is available at any time.

Mr Grant: Can the money be spent without the permission of the Government?

Mr Trolove: Yes. The capital is expendable for buying wool.

Mr Pannett, North Canterbury: What is Mr Boyd-Clark's opinion on the average quality of New Zealand wool?

Mr Boyd-Clark: The average quality of New Zealand wool has varied with the development of the fat lamb industry. In Invercargill we used to get Romney hog wools you could hang yourself on—mostly running 40/50s Bradford quality. There used to be more of the Lincoln and Leicester type wool. I would also make the observation that the present day clip is more affected by climatic variations than it ever used to be and bad seasons are seriously reflected in wool quality.

Mr Pannett: What are the relative amounts of money spent in the interests of New Zealand wool?

Mr Trolove: A great amount of money is spent on publicity and research. The International Wool Secretariat was primarily set up for promotion and publicity. I am sure that if we were not spending these sums on publicity, wool would not command anything like the price or position it holds today. The slogan "There is no substitute for wool" is continually advertised in America, England and the Continent and a great deal of publicity of all descriptions is carried out in schools, factories and similar institutions.

Regarding research, a very substantial part of New Zealand's standard of living is attributable to the prosperity of her primary industries. The cost of research should not rest wholly on the producer when the success of the industry is of direct importance to the whole community. The Meat and Wool Section of the Federated Farmers and the Electoral College have from time to time indicated

that the Board should not usurp the functions of Government Departments or assume full responsibility for the cost of research.

Mr Boyd-Clark: Furthering Mr Trolove's remarks on the need for publicity to combat the threat of manmade fibres, it seems to me that price is the limiting factor. When I am overseas it amazes me the number of times a purchaser knows he wants all-wool articles but rejects them because they are too expensive. They know wool is the finest fibre for clothing but if you only have £10 you cannot buy a £30 all-wool suit. Research is vitally necessary so that we may double the quantity and halve the price.

Mr Denham, North Canterbury: I would like to bring up the question of wool by-products.

Mr Boyd-Clark: Lanoline is extracted from the scouring liquor in the United States and Britain of course, but because of the distances of our overseas markets it is not an economical proposition in New Zealand.

Mr Pannett: Following my first question and seeing that the average quality of wool does not seem to have improved over the years, would it not be more sensible to spend money on improving the wool rather than pushing the sales of an article which is no better than it was 20 years ago?

Mr Trolove: It is up to the farmer to do this. Per acre returns are important and we are improving these rapidly. Through the Wool Board, the growers are sponsoring research by making a grant to Dr Henderson and giving a similar grant to Massey College where work is being done on specific projects relating to wool production in New Zealand. Grants are also given to the New Zealand Veterinary Council, the Gisborne Veterinary Club and the New Zealand Woollen Mills Research Association as well as bursaries to research students. As far as quality is concerned—we have been extremely lucky as so much of our wool is in the more keenly demanded 50s and below qualities. During the past season most of the wool above 50s quality was down in price, 60s being approximately 15 per cent. below last season's prices, while the 50s and below were up by some two and a half per cent. In New Zealand we were able to maintain our overall price, but in Australia the gross receipts dropped £50 million.

Dr Burns, Lincoln College: We are most grateful, Mr Chairman, to the Wool Board in the assistance given to this College specifically to Dr Henderson for research.

Mr Samson, Marlborough: The question of research was fully discussed at Timaru last year and I feel that we, as farmers, *are* responsible. We cannot expect the Government to pay unless we are prepared to pay. A levy of 2/6 per bale would provide £100,000 as finance for a Council of Research in the sheep industry which, in conjunction with Government support, really could accomplish something.

Mr Trolove: I would remind Mr Samson that the Wool Board is entirely in the hands of the growers and their policy is one given them by the growers, largely through the decisions of the Electoral College and the Meat and Wool Sections of Federated Farmers. The Wool Board is in your hands and if you want to pay a further £100,000 a year for research then the Wool Board will certainly carry out your wishes.

Mr Matheson, North Otago: Would Mr Boyd-Clark give his opinions on the marketing of scoured wool and would it be in the farmers' interest if wool was scoured before sale?

Mr Boyd-Clark: Definitely no. It is most difficult to sort scoured wool and sorting is very necessary. Some of the back country Merino wool is scoured for special markets.

Mr Oliver, North Canterbury: What does the wool trade think of the bogy of synthetics?

Mr Boyd-Clark: Synthetics are gaining ground because of price. The blanket trade in the U.S.A. is almost lost to synthetics because people will not pay the price of a wool blanket.

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3. THE VALUE OF STATISTICS TO THE WOOL INDUSTRY

Mr B. P. Philpott, Statistician of the N.Z. Meat and Wool Boards' Economic Service.

The inclusion of a paper on the value of statistics seems to me to be justified for at least two important reasons. In the first place, you as farmers are called on annually to provide the information from which the New Zealand farm production statistics are compiled and you also provide the financial support for organisations such as the International Wool Secretariat and ourselves, which are engaged in collecting and using statistics. It is only natural therefore that you should wish to know periodically what use is being made of this information.

The second reason is that the use of statistics is itself too often a matter for dispute. Benjamin Disraeli held very strong views on this matter. He is reported as once saying that, in his opinion, there were three sorts of lies: lies, damned lies and statistics. As a politician of course he would know, for the art of bolstering up your argument with favourable statistics has been developed to perfection in political debate and has helped to discredit statistics in many people's eyes so that common credence is given to the view that "you can prove anything with statistics." The opposing view, which is equally wrong, is that "you can't dispute figures," or that "the figures speak for themselves." To clear up this dispute would be far beyond the scope and intention of this paper but perhaps some light may be thrown on the matter as we proceed.

Statistics can be used in two ways. Firstly, they are useful in themselves as measuring, quantitatively, the facts of any situation without in any way explaining why the facts are as they are. Secondly, in the hands of trained statisticians, statistics can often be used to very good effect in explaining why the facts are as they are. That is to say they can be used to demonstrate the truth or falsity of hypotheses about relationships of cause and effect between the facts.

It will be useful therefore to discuss first the sources and nature of the statistical facts available to the wool industry and then go on to consider the use of some of these statistics in attempting to explain and interpret the wool situation.

The national statistics relating to sheep farming and wool production in New Zealand are found in two important publications. (1) In the "Annual Report on Farm Production Statistics" the Census and Statistics Department publishes the figures which it now collects from a sample of 13 per cent. of New Zealand's farms. These figures which give a broad picture of New Zealand farming in general are mainly concerned with the number and areas of holdings, the areas in

crops and grass, the details of the stock carried and the quantity of fertiliser used. (2) In its "Statistical Analysis of Wool Sold in New Zealand," the New Zealand Wool Commission publishes annually a very complete and detailed analysis of the New Zealand wool clip. The quantity of wool sold in each centre is subdivided according to its quality, style, grading, yield and weight per bale. These figures, which provide the basis for calculating the total New Zealand wool clip each year are aggregated from the separate assessments made by the Commission's appraisers of each lot of New Zealand greasy wool offered at auction sales in New Zealand and London. Though most of the other main wool producing countries publish statistics of a broad nature relating to wool production none so far as I am aware has such a full and detailed description of its clip as that provided by the Wool Commission which, on this ground alone, has therefore been of enormous value.

There are of course many gaps in our statistical knowledge especially as far as sheep farm production statistics are concerned. As the official figures deal with all types of farms together, any consideration of sheep farming in isolation is well nigh impossible from the official figures. However, these gaps are being filled by the work of the New Zealand Meat and Wool Boards' Economic Service which is a third source of New Zealand sheep-farming statistics. By means of the continuing sheep farm survey which the Service conducts, there is being collected a great amount of very useful data especially in relation to production, farm management and financial returns—matters on which our knowledge was particularly deficient.

The responsibility for collecting and publishing statistics relating to world wool consumption and trade, and wool textile production and trade, lies with the Commonwealth Economic Committee in London in conjunction with the International Wool Secretariat. Most of the information is collected from, and with the excellent co-operation of, the wool manufacturing associations. Every quarter the Commonwealth Economic Committee publishes the statistics of quantity of wool and other fibres consumed in the mills of the main consuming countries, the output of tops, yarns and cloth, and the exports and imports of these products. These statistics are as good as, if not better than, those pertaining to any other of the important commodities entering into world trade and the International Wool Secretariat and the Commonwealth Economic Committee are constantly directing their efforts to the improvement and extension of the figures.

As a result of this continual collection of statistics it is becoming possible to answer some important questions of fact. For the purposes of illustration the following are a few of the many possible questions some of which can be answered with our Economic Service data and others with data from other institutions.

(1) How does wool production per sheep and per acre vary as between farms and between districts?

(2) What are the price differentials for better style wool or finer wool?

(3) What is the cost of wool production and what is the effect on farm revenue of given changes in the prices of meat and wool?

(4) What is the ultimate destination of the wool clip?

(5) What are proportions of merino and crossbred in the world clip and are the proportions tending to change?

(6) What are the proportions of wool and other fibres in fibre consumption of the wool manufacturing industries?

We turn now to what is the more important use of statistics; that is in either demonstrating the falsity or supporting the truth,

of suggested explanations as to the operation of cause and effect. Now that the collection of facts has been organised we at the Economic Service are in a position to begin to use our statistics in this manner. As examples I might perhaps mention the following types of study:

(1) The effect on production of topdressing and farm management practices.

(2) The relationship between wool quality and fleece weight.

(3) The effect on wool revenue of different methods of marketing wool—of binning, classing, or selling in London.

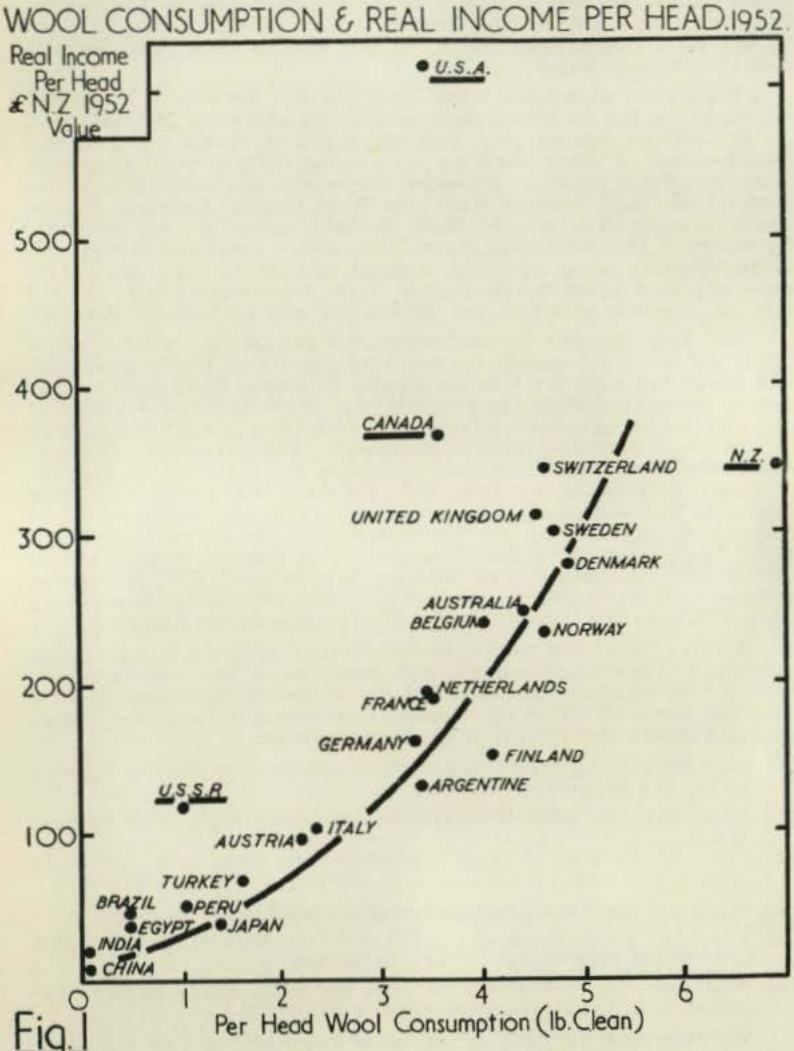

Fig. 1

(4) The reasons for the differences between farms in the cost of wool production, and in production per acre.

Other investigators, including the International Wool Secretariat, have made good use of wool consumption statistics in studies of the factors influencing the demand for wool, and wool clothing, and of the factors influencing wool prices. This type of work is never finished for new statistics and new ideas are constantly arising to modify and improve the conclusions.

To give some precision to this discussion I have prepared two diagrams which show the results of investigations into two aspects of the world wool market.

In Figure I an attempt is made to answer the question "What is the reason for differences in wool consumption per head in different countries?" and the hypothesis suggested is that apart of course from differences in climate such differences are accounted for by differences in the standard of living as between countries. On the base line of the diagram is a scale for wool consumption per head in pounds, and on the left side a scale for real income per head in New Zealand 1952 £'s. By real income (as distinct from money income) is meant money income adjusted for changes or differences in the purchasing power of money. The position of the dot for each country represents the per head wool consumption in 1952, for that country (read on the bottom scale) and the real income per head in that country in 1952 (read on the left-hand scale).

The figures of wool consumption per head are calculated by taking the amount of wool and wool textiles produced or imported and consumed in each country and deducting the amount exported in the year 1952. The figures for real income per head are derived from United Nations' statistics of real income in 1949 dollars and converted in New Zealand 1952 £'s.

You will notice that as real income per head increases wool consumption increases, as expected. What is far more important, however, is that wool consumption appears to increase with income, in a fairly orderly and consistent way indicated in fact by the curved line around which the countries are grouped. This line has been fitted to the points by a technique known as "regression analysis" and it provides a formula which enables us to calculate that wool consumption per head increases by about eight per cent. for a ten per cent. rise in income when income is around £200 per annum. The curvature of the line indicates that at higher levels of income than this, the proportional response in wool consumption to changes in real income is less, and at lower levels of income it is more. That is to say if you raise the standard of living of people in countries with a low standard of living they will spend more of the increase on wool textiles than will people in countries on a higher standard.

You will appreciate that these conclusions are of considerable significance when the analysis is used in rough forecasts of the future of wool. Such forecasts will depend on our estimate of the future populations in main consuming countries and of the comparative rises to be expected in the standard of living in poor and rich countries.

You will notice that there are some countries (underlined) on this diagram, which do not fall into their correct places on the curved line. For example New Zealand consumes far more wool than the level of real income would appear to justify while the United States and Canada consume far less. It is known that New Zealand consumes per head less cotton and synthetic fibre than other countries, while the United States consumes more, and so these divergences may arise from differences in people's fibre preferences in these

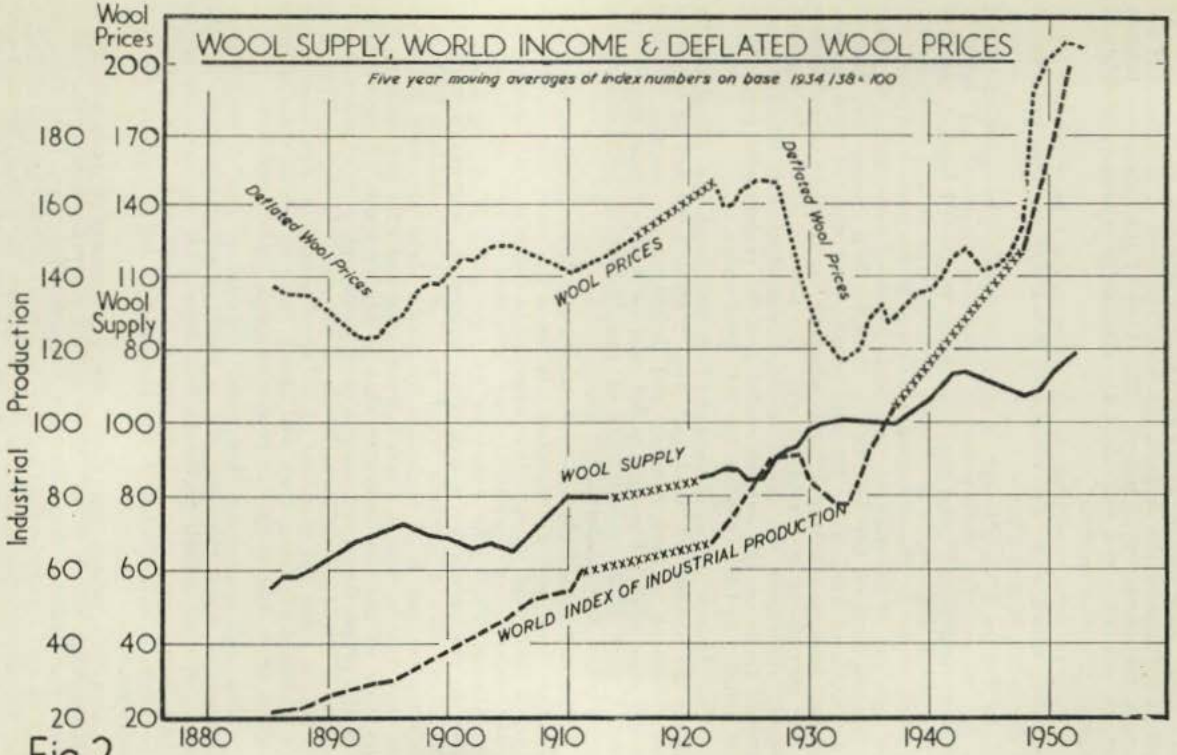
WOOL SUPPLY, WORLD INCOME & DEFLATED WOOL PRICES
Five year moving averages of index numbers on base 1934/38 = 100
Wool Prices
Industrial Production
Wool Supply
200
180
170
160
140
140
110
120
80
100
100
80
80
60
60
40
40
20
20
1880
1890
1900
1910
1920
1930
1940
1950
Deflated Wool Prices
WOOL PRICES
Deflated Wool Prices
WOOL SUPPLY
WORLD INDEX OF INDUSTRIAL PRODUCTION

Fig.2

countries, but no doubt there are other reasons and this could well be a field for further investigation.

Figure 2 is rather broader in the scope. The intention was to secure some idea of the influences operating on the long run trend of wool prices. In the previous example we suggested an answer to the question "How much wool do people want to consume at different levels of income?" Now if there is a change in income (say a rise) people can only consume more wool if there is more available; if not the price must rise and similarly, for a fall in income, the price must fall. We should therefore expect to see some effect on the price of wool, of changes in total world income (i.e. per capita incomes multiplied by population) and of changes in the supply of wool.

It has been possible to compile figures of wool production for the seven main producers from 1885 onwards. The level of wool supply from these seven main producing countries is shown on the diagram. As an indicator of total world income the index of world industrial production is used, representing as it does the output of all material goods in the main industrial countries, which are also the main wool consumers. The index of industrial production thus gives an indication of the changes in industrial consuming populations and in the real purchasing power which they have available to buy wool textiles. The price of wool is the price relative to the prices of all other goods, that is to say, account has been taken of changes in the value of money through inflation and deflation. All three series, wool supply, wool prices and industrial production are expressed as five year moving averages of index numbers on the base of 1934-38.

This means the average of the five years 1934 to 1938 has been taken as a base and equated to 100.

You will see that looking over this long period of years wool supply and world income have, until recent years, marched roughly in step but that there have been many ups and downs which in turn have produced fluctuations in wool prices. Broadly speaking whenever world income tended to rise faster than world wool supply prices tended to rise and vice versa. For example in the period around 1890 a great expansion in wool production relative to income was associated with a fall in price and again this happened around 1910. In the 1930's a violent fall in world income with wool production still rising was associated with an even more violent fall in wool prices. In recent years the rapid growth in world income together with the slow rise in production has been associated with the high levels of wool prices which we are at present enjoying.

Using the data shown on Figure 2 it is possible to calculate statistically the effect on wool prices of given changes in wool production and in world income. That is, we can test the hypothesis that these three variables are related in a determinate way and it certainly appears from this work that the facts support the hypothesis. However, rather than develop the argument further, I would prefer to use the diagram to suggest two things.

The first suggestion is that, with world income tending to increase so much faster than wool production, we can reasonably expect the present steady demand for our wool at good prices to continue even in the face of an expansion in synthetic fibre production. In fact there should be room for much larger quantities of both wool and synthetics to allow an increasing number of consumers to consume an increasing quantity of wool textiles per head at present day prices. Wool producers can (and should) expand wool production, in the confidence that they will not be forcing prices down against themselves, and that by keeping the world well supplied with wool they will not be encouraging too great an inroad by synthetics.

The second suggestion is that if we encounter another slump comparable to the 1930's then everything possible should be done on a world scale to maintain the level of wool production by supporting the price and stockpiling the wool, a policy that has in New Zealand already found expression in the setting up of our Wool Commission. This would avoid the long run effect of a disastrous price fall. In the 1930's, this effect was, as you can see, to slow down the rate of increase in wool production and to contribute in part to the contemporary wool shortage. After all, serious though the slump seemed to us at the time, the fall in world income was only a dip in the expanding level of income and the fall in wool prices could not be said to have arisen from any long run overproduction of wool.

The examples I have given—the explanation of inter-country differences in per capita wool consumption, and of movements in the long run trend of wool prices—are two of the many instances of the use being made of statistics to improve our knowledge of the economics of the wool market.

I would be the first to admit that in discussing and interpreting the wool situation I have done so with the aid of hindsight, but it is with the use of hindsight that we try to benefit from past experience. In extracting this benefit statistics and statistical method are indispensable and of the greatest value to the wool industry.

DISCUSSION

Mr Scott, Mid Canterbury: What is the increase in consumption in sythetic fibres in the United States since 1952 until today?

Mr Philpott: The only figures I can give you at the moment are that the United States consumed 50 million lb synthetics (in the wool industry) in 1952 and 60 million lb (in the wool industry) in 1954. In 1953 the United States' consumption per head was 3.4 lb of wool, 8.6 lb of synthetic fibre and 24.2 lb of cotton. The 1953 United Kingdom figure for total synthetics consumption per head was 6.2 lb.

Mr Trolove, Marlborough: Are there not occasions when "supply" is artificial? Would that not be so in 1948-49?

Mr Philpott: Yes. The decline in wool supply in 1948-49 was not the specific result of a price movement, there were other factors operating. A drought resulted in a large reduction in sheep numbers in Australia, and the production of wool fell in the United States because of increasing economic difficulties in the sheep industry.

Mr Matheson, North Otago: Is the consumption of wool higher per head in New Zealand because there is a wool cost subsidy to the mills?

Mr Philpott: It has some effect but not much. The cost of wool is only some eighth or ninth of the cost of clothing, thus a change in wool prices is not reflected to the same proportionate extent in the price of clothing. For example, if the price of wool were lowered by, say 25 per cent. (by means of the subsidy), the price of clothing would only be lowered by about three per cent. I doubt if that is enough to affect the consumption as much as the diagram indicates and I am inclined to think that the high consumption of wool in New Zealand is due to New Zealand clothing habits.

Mr Topp, North Canterbury: Is the general threat of war keeping wool prices high?

Mr Philpott: I would say that to the extent that wool has been bought for defence or stockpiling purposes, this has had the effect of raising the price somewhat, but this has not been appreciable, for

the post war rise in wool prices can be explained almost entirely in terms of changes in wool supply and in world income. What has applied in the past still applies, though there are all sorts of other influences operating that are marginal in their effect. Any slackening of international tension, initiated by the Russians, accompanied by a shift to consumer goods production in that country, could lead to greater Russian wool purchases and this would have an effect on wool prices just as beneficial as the cold war may have had.

Mr Scott: Further to the question of the consumption of synthetic fibres in America, has the challenge been made to wool or cotton?

Mr Philpott: The challenge has been to both wool and cotton, but up to the development of the new true synthetics, nylon, terylene and the like, the main synthetic was rayon, and this was a direct competitor with cotton and silk, which fibres it resembles. The threat of rayon to wool lies in the fact that it can be used in mixtures to cheapen cloth when wool prices become too high. The new synthetics are much more expensive than wool at present, though most observers expect that they will fall in price in the future. To meet the synthetic challenge, therefore, the price of wool must be kept down by continually expanding the supply of wool.

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4. THE PRODUCTION OF WOOL

A.—MERINO

Mr A. A. Urquhart, Erewhon, Mt. Somers.

The name of the run I occupy is "Erewhon" and this name immediately prompts people to ask about its history. Actually the name was given to the run fairly recently and was no doubt attached because of Erewhon's proximity to Samuel Butler's station, Mesopotamia. The original name was "Stronschrubie," which is the Gaelic for "crooked nose" and was so-called by Mr George McCrae, one of the early owners of the run. The name is descriptive of a crooked spur leading down to the homestead.

Erewhon is situated at the headwaters of the Rangitata River and includes the country through which run the Havelock, Clyde and Lawrence rivers. The surveyed area is 35,500 acres, of which two-thirds has a northerly aspect, the remainder being dark country. Access is by road and it is 36 miles from the nearest township to the homestead. This road may be impassible at times owing to snow, flood or slips.

Rainfall is fairly high, averaging about 60 inches per annum with heavy falls in the spring from the north-west. Heavy falls of snow are frequent throughout the winter months and come mainly from the north-west as we are too far back for the sou'-westers. Snow can be a real hazard and owing to the topography of the run snow slips can cause considerable stock losses. The country is very steep, running from 1,850 feet at the homestead to 8,900 feet at Mt. Arrowsmith which is at the head of the Lawrence. Other peaks around Erewhon include Cloudy Peak, 7,870 feet, between the Havelock and Clyde rivers, and Mt. McCrae of 5,675 feet, between the Clyde and Lawrence rivers.

It is very rocky, broken country with many bluffs and many of the basins grazed by sheep are rockbound, the only access being in over the high saddles at approximately 6,000 feet.

There are many patches of bush on the lower slopes which

include a wide variety of native trees, making the country very attractive to trampers and visitors to the area. Owing to the rocky broken nature of the terrain there are some very picturesque waterfalls.

This type of country suits the chamois and in some years they are very numerous. Their presence is not welcomed by shepherds during mustering because when they are disturbed on the heights above they dislodge loose rocks. Deer are also present but not in great numbers. There are a few thar but these are not often seen. One of our great pests is the kea, and while I think he is a most attractive and interesting bird, his presence is not welcome owing to his destructive habits. In the first five years I was at Erewhon they caused a lot of deaths in the flock, but now their numbers have been much reduced by shooting and poisoning.

The run is divided into three main blocks by the rivers previously mentioned and these blocks were originally three separate runs. A good deal of shepherding is required in order to handle these blocks to the best advantage. Sheep have to be spread out in order to suit the grazing areas and frequent supervision is necessary to avoid any excessive concentration of stock on one area.

At this stage it is appropriate to give a brief summary of the routine followed with the stock throughout the year. In the spring the hoggets and wethers are all eye-clipped and as soon as the snowline retreats we begin to move our sheep out on to the freshly cleared country so as to ease the pressure on the wintering areas. The actual time depends on the season but is usually towards the end of August. In October or November a certain amount of cultivation is done and a small area is sown in turnips and oats for the winter use of the stock around the homestead.

At the beginning of December the shearing muster begins. This usually takes the greater part of December and between Christmas and the New Year the lambs are docked. Shearing commences with the dry sheep in the first week of January and after shearing and at about the end of January the sheep are taken out to their summer country which consists mainly of the high basins and some shepherding supervision is necessary even at this stage. The autumn muster commences at the beginning of April and all the high basins inaccessible from low levels must be cleared first because there is grave risk of early falls of snow blocking the high saddles leading to these areas. The remainder of the summer country is then mustered and the lambs weaned and put out on fresh blocks. Sheep are held on the lower country until it is thought that the winter snowline is reasonably stabilised.

The ewes are mustered again in May and are eyeclipped and dipped. Rams are put out on the 1st of June and sheep are held on fresh holding blocks during tupping. Rams are taken out in mid-July and ewes are then crutched and turned out on their winter country which by this time is well bounded by the winter snow level.

The flock is entirely Merino and since I took over the run in 1943 there have been quite a few changes. When I occupied the run I considered that the type of sheep was not wholly suitable to the country and I embarked on a programme of breeding the type of sheep and wool I considered would give me a better reward. I have managed to do this and the clip per head and the total wool produced have been very considerably increased. A point of much interest is that in the past there was a high incidence of sand in the wool whereas today there is very little.

In 1943 I shore 3,000 sheep and took 60 bales of wool. In the

1954-55 season 6,000 sheep were shorn and I will have 150 bales of wool. Figures for the latter years are as follows:

Season	No. Bales	No. Sheep Shorn	Total weight Wool (lb)	Av. weight per head (lb)
1950-51	.. 131	5,600	35,402	6.3
1951-52	.. 143	6,265	41,924	6.7
1952-53	.. 139	5,761	43,206	7.5
1953-54	.. 144	5,972	45,467	7.6
1954-55	.. 150	6,136	49,757*	8.1

*Includes an estimate of the weight of 22 bales still in the shed.

The composition of the flock has remained fairly constant and today it is made up of approximately 2,500 ewes, 2,500 wethers, 1,000-1,200 hoggets and rams—an approximate total of 6,000.

Lambing percentages have remained fairly constant at between 65 per cent. and 70 per cent., based on number of ewes put to the ram. Two-tooth ewes are not put to the ram and about 2,000 ewes are mated each year.

Now with regard to the wool itself it is a little difficult to know how to begin. There are many different types of Merino wool and good reasons for growing each of these different styles and strengths. One could very easily become involved in a long discussion on the relative merits of each type. All I can do is to quote my own experience.

As I said previously, when I came here there was a mixed flock and as sheep were scarce I had to buy ewes of mixed breeding and ages, making matters even worse. But what was most noticeable was the amount of sand in the wool. There was hardly a fleece free from sand in the whole clip and it is no wonder that the old-time shearers used to complain about the "Scrubie" sheep because they were really tough shearing. I felt that it must be possible to get sheep which would be less likely to take sand in their wool. For that reason I decided to try to breed them myself and started a small stud. I did not say much about my hopes of being able to breed a sheep with a type of wool less likely to take sand until I had some practical proof. You can imagine my interest when last year I met Dr Henderson of Lincoln College and found that he was working along similar lines with respect to fleece rot and that he considered that it was possible to breed a type of wool likely to be free from this trouble. I think now that I have sufficient proof to say that it is possible to breed these sheep less likely to take sand in their wool.

The prices I received for the first lots of wool sold from Erewhon were among the lowest received by any of the stations for that class of wool. Over the last few seasons the prices have improved with the improvement in the quality of the wool to such an extent that Erewhon wool has been among the top-priced wools. It is rather satisfactory that relative prices for the clip and fleeceweights have increased together. It is now possible also for a shearer to shear more sheep in a day than previously, so both the shearer and I have been rewarded.

I will now return to the stud which is really the key to the improvement in the flock. My first move was to sort out sires which I thought would leave progeny of the sand-free type and at first I was very successful, but I then bought in a ram which gave me something to think about as 90 per cent. of his progeny were "sand rubbers." These sheep would clip a large fleece of rather nice wool

providing they did not get near a bank; yet another sheep which carried what I call a "clean" type of fleece could be run on the same block and would stay perfectly clean and free from sand. This particular ram was used twice with the same result, but I must say his ewes proved most useful for testing fresh sires. These ewes with some of my clean-fleece types are mated with my stud rams and then all turned out on the hill under natural flock conditions. The sandy type come in each year full of sand, but if these ewes are mated to a sand-free type of ram their progeny will become 80 per cent. or more sand-free and will remain so. The progeny from the "clean" ewes will be almost 100 per cent. like their parents. This shows that the clean type of wool is fairly strongly inherited and these tests were the means whereby I decided that my selection methods were on the right lines.

It is almost impossible for me to describe in words the type of wool which I consider is a "clean" type and will not take the sand, but in my own flock I am quite confident of my ability to pick out these sheep. I should mention that any sheep, clean type or otherwise, will not stay clean if it is allowed to become infested with ticks or lice, because under those conditions any sheep will "rub" and wool will become sandy.

Under normal flock conditions I think that by careful selection on wool type and testing of all stud sires we could achieve a much bigger proportion of clean Merino wool from our back country.

B.—HALFBRED

Mr C. G. Cran, Bayfields, Canterbury.

In preparing this short paper of our experience of Halfbred breeding, I am aware that probably no other sheep has been subject to more criticism and controversy—especially of late years. It is now many years since sheep-men in this country experimented in crossing longwools and Merinos, the one object in view being to produce a dual-purpose animal. There is no sheep known to mankind more hardy or versatile than the pure Merino, which can live under 7,000 feet altitude conditions, and yet thrive and fatten at sea level on rich pastures. Many crosses of longwools and Merinos have been tried; the English Leicester and Lincoln (which eventually produced the Corriedale); Cheviot, Border Leicester, and more recently, the Romney. I have no desire to speak of all these crosses and will confine myself to the details of our own experience.

Our purpose in breeding Halfbred rams was to attempt to produce an animal suitable to our conditions. It was not intended to sell rams, but only to use them on the "Bayfields" flock, which at that time numbered around 7,000 ewes.

The country is typical Canterbury foothills, ranging from 1,600 to 4,000 feet. The climate is rigorous with long and often severe winters and an annual rainfall of 45 inches. The estate owned a pure English Leicester flock, which was used to breed English Leicester rams to mate with Halfbred ewes, and help produce the once-popular Threequarterbred, which gave to New Zealand the historic name of "Canterbury Lamb." Merino rams were mated to some of these English Leicester ewes, but much had to be learned to find the answer to what was our aim—progeny with free growth of wool of 56/58 quality and a carcase that would fatten easily on the place and appeal to the down-country farmer who was the purchaser of our cast for age ewes. We were particularly anxious to keep away from

the light-boned, tight-wool type, for the fattening of the wether lambs was very important, and we were also desirous of a good draft to go off the mothers. The annual clip was around 250 bales and we hoped to maintain, or perhaps improve, the quality of wool.

We first thought that a strong English Leicester ewe and a strong combing Merino ram would give the desired medium type, but soon found it did not work out that way. Later a fine combing Merino ram to a strong woolled ewe was tried, but this also gave a considerable variation in wool type. Eventually, after many trials and errors, we found that an English Leicester ewe of 46/48s quality to a Merino ram of 64/66s quality gave the results for which we were striving.

I have already mentioned the hardiness of the Merino. The pure English Leicester is less hardy when young, but tough when reared, and breeds profusely even at eight years or more. Apart from some hay in the winter months, the ewes get no supplementary feed—not even the two tooths—and are always in fat condition.

I would like to emphasise that any fault in the ewe or ram is intensified in the cross, such as strong britch, flat rib, cow hock, or, in short, any breed fault. It is essential to keep an eye for character in the wool of the English Leicester. Length, crimp, and lustre are all important; otherwise the Halfbred wool will be straight and spongy. It is easier to keep the wool right on the Merino side, but the body has to be carefully watched. A common fault in the Merino breed is a sloping rump, which is undesirable in the cross. On both sides we breed by selection, and a very negligible infusion of outside blood has been put in to either the English Leicester or Merinos.

The following are authentic figures of wool sold in 1954, from the progeny of our first cross rams:

	Quality	Yield %
Hogget	58's	70
1st Classing Ewe . . .	58's	80
2nd Classing Ewe . .	58's	73
3rd Classing Ewe . . .	56's	77
Pieces	56/58's	66
Bellies	56/58's	62

We were able to increase our overall wool weights from a little over seven pounds per head to 9.36 pounds per head—our best figure.

"Bayfields" has little native country now, but we found that sheep depasturing on native tussock to the age of six tooth, and brought into paddocks of English grasses would decrease in wool-count quite considerably.

The foregoing are facts, and I may now be permitted to give some opinions of the Halfbred generally.

In breeding from a first cross ram, the progeny is never more than two removes from the Merino; this gives a constitutional hardiness and quality of wool unsurpassed by any other breed.

A prominent freezing buyer, who purchases many thousands of store lambs every season at Addington for his clients to fatten, invariably buys Halfbreds when they are available, believing they are the best shifters to any type of country. Owing to "Bayfields" being divided for the rehabilitation of ex-servicemen, we now require only a small percentage of the rams we breed. Most of them go to high country, all of which is much harder than where they are bred, but a number go to much better country, and altogether the demand very greatly exceeds the supply.

I may then be asked, if that is so, why such low prices at the Ram Fair for Halfbred rams? My answer is that there is a high percentage of low-quality animals there, and how could it be otherwise when it is taken into consideration that most of their dams are ordinary station cast for age ewes? I admit they are probably mated with a first-class stud ram, but our experience has taught us that first grade animals on *both* sides are essential for high quality in the cross. All of you, who have had experience of stud breeding, will agree with me that you must have numbers to get top sheep. Unfortunately, of the sixty or so registered Halfbred flocks, one quarter of them have fifty or less ewes.

We are frequently asked why we breed from the English Leicester ewe instead of the Merino ewe. We have done that experimentally too, and believe me, there is no difference—always provided that the wool and carcase qualities on *both* sides are the same. The advantage from our method is that, instead of a fair average lambing percentage of 90 per cent. from the Merino, we get 120 per cent. to 130 per cent. from the English Leicester ewe, besides the fact that a Merino can seldom be bred from as a two tooth.

In conclusion, I would like to say that, having had some experience with most breeds of sheep, I am convinced there is a real need in our economy for the first-cross Halfbred.

C.—CORRIEDALE

Mr C. H. Bethell, Timpendean, Canterbury.

I have been asked to address you on my "Methods of Producing Corriedale Wool"—to the wool purist there is no such thing as Corriedale wool, there is wool off a Corriedale sheep. All wool is either 48/50's, 56's, 58/60's, etc., it is AA, BB, B and so on. It is wool, no matter what term the breeder may apply to it, that fits into a given category in the buyer's scale.

Let me start by asking a question and trying to answer it.

Why do we go farming?

We go farming because firstly we have an inborn love of the land and of the stock that inhabit it. We go farming because we hope that we can produce stock or grain or seeds that will find favour with our fellow farmers and that will provide us with a sufficiently large bank balance to live in comparative comfort. We go farming because it is the last industry left that will satisfy an individualist.

Let me stress one more general point and I want to stress it with all the power that I have—that no two farmers are alike. What suits me may not suit my neighbour, and of all industries farming is the one in which the least generalisation can be made. I think the best way to approach my main theme is to divide it into (a) the land and (b) the stock.

I farm a property known as Timpendean in the Weka Pass, North Canterbury, consisting of 1,440 acres of low rolling limestone hills and some small areas of comparatively flat land. Approximately 450 acres have been ploughed and sown in English grasses and clovers; the last major agricultural effort being the sowing down of 30 acres in 1948. The balance is tussock hills which many years ago had been oversown with cocksfoot and white clover. It is well broken up with gullies and there are large outcrops of limestone—the hard Amuri stone. It is well watered and lies well to the sun.

In the past, wheat, oats and sheep feed were extensively grown. Up to 1938 a six-horse team and crawler tractor were kept and it could well be called a mixed farm. It was then proposed to turn it into a purely grazing proposition, but the war intervened.

It was not until 1948-49 that the policy decided on in 1938 could be carried out. Four hundred and forty acres were sold for rehabilitation, leaving the area quoted above of 1,440 acres, and it is from this point that the story can be taken up in more detail. At this time, there were 30 acres of new grass, 40 acres of lucerne and 24 acres of Italian ryegrass and cowgrass. Of the remaining ploughable area the next youngest pasture was sown in 1939 and the oldest in 1919. All of it had had lime and fertiliser applied in varying quantities.

In the autumn of 1948, all the ploughable area retained had had one ton of lime and a third of a hundredweight of super. In 1949 the ploughable area was supered at the rate of one and a third hundredweight per acre and this year saw the beginning of a new era when five tons of super was applied by air to a tussock block, with somewhat staggering results.

In 1950-51 the whole of the ploughable area was given a second ton of lime to the acre. In both years one and a third hundredweight of super per acre was applied. In addition, two further tussock blocks were supered.

In 1952-53 no lime or super was used, mainly due to the very wet seasons and the impossibility of getting the fertiliser to the landing strip, for by now all top-dressing other than liming was done by air.

In 1954 and this autumn all the grass paddocks had their ration of one and a half hundredweight super per acre. This year the three tussock blocks which had previously been top-dressed were again fertilised, this time with cobaltised super and molybdenum super just to see whether there was any marked difference.

In 1952 the Italian ryegrass and cowgrass was ploughed, nine acres being sown to permanent grass and the balance to lucerne in January, 1954. The old area of 40 acres of lucerne had become overrun with weeds and was being treated as a grazing block. The new lucerne sown in January, 1954, after 18 months of fallow and a ton of lime, struck well, one hundredweight of super was applied and then the weeds took control. Various experts looked, held up their hands in horror and departed rapidly. One, R. H. Bevin, however, was helpful and we decided on drastic treatment—we grazed it at the rate of 100 ewes per acre for ten days. This was repeated six weeks later and again in June and now I have a paddock of nearly clean, strong, healthy lucerne.

I have found through experience that the best results are obtained if the liming and supering are done in the late summer, say end of January and February.

I read with interest a recent article in the press by Mr Sim of Carew, on the question of aerial top-dressing of hill country. I think that thousands of tons of super have been completely wasted in top-dressing large areas of low-producing country; country with a low rainfall, and inherent low fertility. But I am certain that there are large areas of our foothills that can be greatly improved by the *judicious* use of super. I have found that super alone has given excellent results on my hills, but I must say that the governing word should be JUDICIOUS. I think that I would be wasting super by pouring it on to my hills every year without lime, but the cost of liming would be prohibitive so I put only super on occasionally—just enough to maintain and improve conditions gradually. This is particularly true as I must consider not only fertilisers in the improvement programme but also the necessity of controlled grazing. I think one and a half hundredweight of super every three years will be the maximum for my hills.

You may well ask, why did I make such a drastic change in farming policy? Firstly, we are either agriculturalists or stock men, a few combine the two successfully. I happen to be one of those cranks who detest the very sight of any agricultural implement but I love stock. Secondly, an agricultural farm demands a large supply of labour, and the labour cost is always the highest cost of any farm. There is also the problem of feeding single men and that very willing beast of burden, the farmer's wife, can easily become immobilised in the kitchen—not her true function. Thirdly, and most important, there was the economic factor.

It is very difficult to compare costs and returns in 1939 with 1948 or 1954, but one effect of the change was to reduce the labour force from three to one, a not inconsiderable saving. Without wearying you with a host of figures, I can assure you that the savings are well worth while and that the returns are quite adequate to give a nett return that is more than pleasing to the tax-gatherer, myself and my bank manager.

You may wonder how I am able to maintain and increase my stock numbers on old pasture, for the greater portion of my farm is very old pasture. I have found that by controlled grazing, the use of cattle, liming (lime is very necessary even on limestone country) but not over-liming, and regular dressings of phosphates, even the oldest pasture can be made to improve—for as you build up fertility you can carry more stock, and more stock means more manure. Once clover is brought back, and I have even re-established cowgrass in some small areas, your problems are on the wane.

My rainfall has varied from 22½ inches in 1949 to 45½ inches in 1953 with an average of 27. While it is essential to have an ample supply of rain I am convinced that once we build up our fertility our pastures are better able to withstand any sudden drought.

I am not a believer in the doctrine of Sir Bruce Levy. While admitting quite frankly the wonderful work that he has done on the growing of high producing grasses, I cannot subscribe to the idea of a pure ryegrass and clover pasture. I am old-fashioned enough to like a good leavening of such grasses as dogstail and timothy, neither are some good healthy weeds to be despised.

Now let us turn to the stock. I run what might be termed a breeder's flock, by that I mean that other than rams no sheep are purchased, sufficient are bred to maintain the flock and all surplus are sold.

The sheep are pure Corriedales, having been bred on very definite lines with one type in mind and today I think it is as even a flock as can be found. It is a type very much of its own and although it may not conform in some ways to the standard laid down by the Society it suits my country and it satisfies me. To achieve this definite type, a careful breeding programme has had to be maintained and heavy culling undertaken. To begin with, continuity of blood lines has had to be achieved. It was founded on Lincoln cross stock and only rams descended from a similar cross have subequently been used. In fact since 1920 only three breeder's rams have been used and the last change in 1948 was made only because of the disbanding of my previous supplier's flock. There have been two very minor infusions of outside blood. In 1940 five rams were purchased from other sources, and used for one season only. Last year two rams were purchased and four this year from other sources. Their progeny are especially marked and will be watched very carefully, if they do not conform to the accepted type then they will be culled.

So the first point I want to make is if you want an even typed flock, do not chop and change the breeding of your rams, and when

you pick upon your ram breeder, pick an old-established one for the Corriedale is a cross of two dissimilar types and naturally you must get sheep tending to one or the other side as well as those in the middle. This tendency will be less with the old established breeder —so pick your flock and stick to it.

What do I want in my sheep? Let me describe what I want when I go to buy a ram. First and foremost I want a sheep. An animal of character that stands up and looks you in the eye, a sheep that you can almost hear say, "What the hell," a sheep that walks well, a sheep that can move with ease and carriage like a good-looking woman who knows that she is being admired. A sheep well set on its legs which must not be too short, plenty of body length, a straight back, and most important of all, a good head, bold, plenty of width between the eyes and a short muzzle. I do not mind if it has brown or black spots on its ears, or pink eyebrows or fawn patches on its socks, or little buttons of horns, or a well-covered head. I do not like a pink nose or pink ears and I prefer black feet but I would not turn out an otherwise good sheep simply because it had white feet. I want an even fleece, not too fine, 50's or 52's for the ram—I have got too fine in recent years. I want a good crimp that comes right out to the tip and in passing I would say never be frightened of a very strong woolled sheep provided that it has crimp. I like a sheep with good heavy belly wool, well woolled legs and as I said before I do not mind a well covered head, but not the teddy bear type.

I do my culling now practically entirely at the race gate, because the head can tell me most things I want to know, perhaps three to four per cent. have to be changed afterwards as you do get the odd one with strong breech or bad conformation.

Let me now describe the handling of the flock, and I propose starting from the time the rams go out.

The ewes are mated about the 12th April, old rams to young ewes. At first I put out one ram to 100 ewes. After a fortnight I bring them in and put fresh ones out. After a further fortnight the others are put back so as to run one to 50 for a further fortnight. The ewes are in mobs of up to 400 and are shepherded regularly. They are kept on the grass paddocks in smallish areas, while the ewe lambs are spread over the tussock hills.

During the winter the ewes are mainly grazed on the tussock hills while the ewe lambs are spread as thinly as possible in the grass paddocks. If it is necessary to give supplementary feed by way of hay then I start with the oldest ewes and work down the ages. No hay will be fed until the end of July, starting with a small ration and gradually increasing. During the last five years I have had to feed hay only in two years. One of my cranks is that I do not like feeding hoggets with hay or chaff. I am convinced that hoggets do much better if they have space to move about in and a reasonably good pasture to graze than if they are kept in confined spaces and fed on hay or chaff. It is a different story if you are feeding roots or green feed, but even then they must have a good run off. All sheep are crutched at the end of July.

For lambing the ewes are run on the tussock hills, even in big mobs, but the two tooths are kept separate. As they lamb they are shedded off into the grass paddocks, and then more or less set grazed until weaning. By the time the ewes go out for lambing there is generally a fresh growth in the lucerne and the hoggets get this before following the ewes on to the tussock. Tailing is done as soon as a suitable mob is available and the knife is used.

The dry sheep are shorn in the first week in October and the ewes in the last week. This may sound early, but I think less damage

is done by shearing when the lamb is young, than when he is a bit older, the ewe is less likely to go off her milk then than say in the last week in November. By taking small mobs no lamb is away from its mother for very long and they are soon back on good pasture. I shear with the blades. All dry ewes are taken out and treated pretty hard.

Up till this year I had always weaned about the third week in January, but this year weaning took place on 14th December and from the experience gained, it has great possibilities and a further trial will be made. At this point I am of the opinion that the earlier weaning is the best. The wether lambs are sold as a line, only sufficient being retained to supply mutton in the following year.

The ewe lambs are crutched and turned out into a specially prepared paddock, that is, one that has not been grazed by sheep for at least three weeks but heavily grazed by cattle. The paddock must have plenty of shade and plenty of easily accessible water. Let us follow the ewe lambs through to the autumn. They are left alone for ten days, to find their feet and settle down to a new life unencumbered by Ma. They are then brought in and dosed with phenothiazine, as a matter of farm routine, the only dosing that I do except in exceptional circumstances. After nine or ten days on fresh pasture they are brought in again, culled and dipped and from then on are in two mobs. They are moved continually and never allowed to spend more than ten days in one paddock. As far as possible I like to alternate between grass paddocks and tussock hill. I am convinced that the successful rearing of hoggets is far more connected with a knowledge of controlled grazing and a sympathetic understanding of the outlook of a young sheep than it is with the usage of drenches. So successful have my methods been that over a three year period my average loss of hoggets between tailing and shearing in the following October is 2.6 per cent. This year from weaning until 15th May from 932 hoggets I have had only one death and that was one that we killed to find out why it was not thriving. An oddity—a ruptured bowel. I am also certain that if you can bring your hoggets from weaning until May in a healthy state then you need have no further worries.

Now to return to the ewes. After weaning they are sorted and culled. Dipping takes place in mid January, all sheep on the place being dipped in the one week. I use a gammexane powder in a tip-dip. Sheep to be dipped are yarded the night before, and I will not dip after 10 a.m. I have not seen a tick for at least ten years. The ewes are then treated reasonably hard with the exception of the four tooths. I think that the process of having the first lamb is a big shock so the four tooths are given of the best right through. During February all the ewes are put over the shearing board and have their toes trimmed. I have never had footrot in the flock and I do not want it. At the end of February or early March all the sheep are again crutched and in the middle of March the ewes are put on to better pasture in preparation for mating.

The previous year's hoggets, now two tooths are culled about Christmas time, and the culls are prepared for sale, these together with the cast for age ewes are sold at the Hawarden Ewe Fair. The cull ewe lambs are sold when the feed position warrants it, this year I do not propose selling any.

A few facts—I am carrying today 2,902 sheep including 1,825 ewes on 1,440 acres. At the same time in 1954 there were 2,594 sheep, 2,674 in 1951 and 3,000 in 1938 on 1,880 acres. My average lambing percentage over a five year period has been 102 per cent. My average loss of ewes for the same period has been two per cent. My average wool weight for a five year period is nine and a half

pounds. This is considerably lower than the previous five year period, and two factors have contributed to it, (a) the gradual fining up of the flock, a process that is now being corrected, and (b) there was a very marked drop in weight following the two years that no fertiliser was used. This is highlighted by the fact that after fertiliser was again applied there was a gain of .8 lb in the first year.

I also run cattle and I am more than certain that cattle are a necessity if we are to improve our pastures and to keep our sheep in good heart. I run Hereford cows, mate them with a Shorthorn bull and sell all the progeny as calves. This necessitates the buying in of heifers or cows, a costly process but I think more economical than breeding my own replacements and having young stock to look after. The old cow can be treated toughly and I have never fed hay to a cattle beast. The cows calve in September and the calves are weaned in April or early May and sold. During the winter the cows are used to clean up the grass paddocks and then go out to the tussock hills where they calve. They are turned into the paddocks as the spring growth begins. At the moment I have 80 cows and another 20 are due before the end of June. I think 100 to 125 cows will be my maximum.

My effective labour force is one married man. Casual labour is used for fencing, and hay-baling is done by contract.

Finally I believe in having the best stock that I can, in looking after them as well as is humanly possible, in having a fair margin of safety as far as feed is concerned and in maintaining my buildings and fences at the highest possible level.

My average gross return per acre over a five year period excluding the year of high wool prices, is £7/3/9, my costs are low, and as a comparison I can tell you that my nett return per acre is only very slightly lower than the nett return of the average fat lamb farmer on the Heretaunga Plains of Hawkes Bay.

Have I achieved those things that I suggested were necessary to a successful and contented farmer? My surplus stock sell above the average, therefore presumably they find favour with my fellow farmers, my returns enable me to maintain my farm well and allow me to live in comparative comfort and the aims and ambitions of an individualist have been satisfied.

C.—CORRIEDALE

Mr G. T. Askin, Ealing, Canterbury.

When asked to contribute this paper to this year's conference, the first thought which struck me as I looked at the outline of the programme was how very important a part lucerne played in the production of wool, so I hope you will excuse me if I trespass a little on to the subject of lucerne, for I believe without that very important plant the maximum production of wool cannot be achieved, whether it be on light, medium, heavy or hill country.

TABLE I
Soil Analyses

	pH	Calcium	Potash	Phosphate
1944 ..	5.3	3	High	2.4
1954 ..	6.5	10	High	5.0

The property on which I farm is in the Ealing-Coldstream district and has an average annual rainfall of approximately 24 inches. The soil type is classified as the Lismore shallow, stony, silt loam and

soil tests taken from the unimproved state show the pH 5.3, calcium 3, potash high, with available phosphate at 2.4; so from these analyses you can gather that this type of soil has not been anointed with many of the necessary elements which go to make sheep farming either easy or successful.

The area of my farm is 1,183 acres subdivided into 35 paddocks and watered by County races. In its unimproved state it had a carrying capacity of approximately three-quarters of a ewe per acre with replacement hoggets. The sheep were not of a good bone type as could be gathered from the calcium content of the soil, and a wool clip average of about seven and a half pounds per acre. The problem of fattening off the old ewe was a major one especially in a dry season similar to the one we have just experienced. The soil when cultivated would powder very readily, consequently would blow equally so, and then with an inch or two of rain would set down hard making the destruction of browntop, etc., very difficult. The pastures had a lifetime of no longer than three years and by that time had reverted to sweet vernal and hairgrass, making a very inflammable paddock.

In the year 1944 a programme of general pasture development was begun. The first step was to topdress about 200 acres of the better pastures with one ton of lime and later with one and a quarter hundredweight of super per acre. The second step to establish a stand of lucerne—this stand, a moderate five acres, was watched with great interest and enthusiasm, more so than any 50 acres sown today.

In this type of farm development where costs of improvement must be met from income the initial progress is not rapid; for instance the cost to establish a stand of lucerne to produce 3,000 to 4,000 bales is very little compared to the expense of the necessary machinery which it takes to harvest it, and that machinery I feel sure must be available when required if first class hay is to be harvested, and that good hay must be kept dry. Here again the expense of a 3,000-bale barn is quite considerable, however necessary.

I now use a two-year rotation—the first year from grass to turnips with two hundredweight of super plus one ton of lime per acre, and the second year sown down to rape and grass with D.D.T., super and a further ton of lime using the following mixture:

15 lb perennial ryegrass
2 lb white clover
2 lb crested dogstail
4 lb cocksfoot
2 lb rape.

In the initial stages of development the mixture contained three pounds subterranean clover, but year by year this sowing was reduced and is now no longer necessary. I am aware that sowing down with the rape crop is not standard practice, but as weaned lambs are very dainty feeders I have found the young grass a good balance of diet in conjunction with rape. The remaining second growth is eaten down hard with ewes in the autumn and not allowed to come again, so giving way to the young grass and clover.

At present there are 838 acres in grass and clover, 175 acres lucerne and lucerne cocksfoot, 70 acres turnips, 50 acres rape and grass, with 50 acres sown to Italian ryegrass for green feed. All the pastures have received three tons of lime per acre and the lucerne three to five tons per acre. Almost all the grass paddocks are top-dressed with one and a half to two hundredweight of super each year and every third year receive the equivalent of two pounds 100 per cent. D.D.T. for grass grub control.

TABLE II

Topdressing, Hay and Crops

	Acres topdressed		Tons		Lucerne		Other Crops
	Lime	Super	Lime	Super	Acres	Tons Hay	Acres
1944	185	190	220	22	5	5	195
Average 1945/53	240	550	250	45	20	100	190
1954	590	1050	600	98	175	120	180

It is only with the sowing of certified grasses and clovers, heavy applications of lime and continued topdressing with superphosphate and D.D.T. that these good pastures can be maintained. Not only do they have a much higher carrying capacity, they also present a great deal less fire risk than the masses of sweet vernal, hairgrass and browntop which are all too common.

It is not until the second time round—perhaps five to six years—when these improved pastures are ploughed up, having carried increasing numbers of sheep with a consequent higher fertility build-up, that really good progress can be seen. The soil has quite a different tilth. It has progressed from the original fine dusty type to a good granulated soil not nearly so likely to leach or blow. After the soil has reached this stage I feel sure, good pastures can be maintained indefinitely without further cultivation.

The area of 175 acres of lucerne and lucerne cocksfoot has been sown in eight different blocks and not on any occasion have these stands failed to strike and thrive particularly well. About 50 acres are utilised each year for winter hay and the balance used for grazing, green feed or extra hay as seasonal circumstances demand. The grazing of this lucerne has been very satisfactory and so far has shown no detrimental effect, in fact one paddock which has been grazed continually for five years is in better shape today that it has been at any time.

TABLE III

Stock carried

	Ewes	Ewe Hoggets	Rams and Wethers	Stud Sheep
1944	640	120	30	—
1945	760	150	50	—
1954	2100	625	100	150

The system of management of my Corriedale flock throughout the year is designed with an eye to maximum wool production. Ewes with lambs are set stocked at three to four per acre with a certain proportion of the pastures held in reserve against dry spells. In a normal season the lambs are weaned when the rape is ready, and not before. Approximately one-third of the wether lambs draft fat to the works. The balance go straight to rape with the exception of a small percentage which are returned to grass, to grow a little. The ewe lambs go to grass paddocks and lucerne especially saved for the purpose, and are rotationally grazed. I do not group all the ewes in one or two large mobs, but as far as possible return them to the paddocks in which they reared their lambs. The ewes remain in the paddocks set stocked until the rams go out. The finer ewes are mated to coarser rams, and the coarser ewes to finer rams. These various

mobs are again set stocked but use is made of lucerne to supplement the fed supply during this vital period. They remain set stocked into the winter until their paddocks are unable to support them without hay, whereupon they are regrouped into larger mobs and fed lucerne hay in selected paddocks until turnip feeding commences early in July. Use is made of turnips in conjunction with limited grazing of the pastures during the lambing period. Although by top-dressing, earlier growth is available on the pastures, the continued feeding of some turnips during the lambing period allows the pastures to get away to vigorous growth, which is essential to support my stocking rate of three to four ewes with lambs per acre.

The lambing percentage averages about 110. The wool weights which so far reached 25 lb per acre in 1952 have since fallen this year to a little over 22 lb per acre owing to the great number of ewes carried in preference to dry sheep, and also a recent purchase of an additional 150 acres of undeveloped land; however a decided increase on the nine pounds per acre ten years ago.

The production figures during the three periods of development shown in Tables II and III are summarised in the following Table IV.

TABLE IV

Wool and Lamb Production

	Total Production		Production per Acre	
	Wool lb	Lamb lb	Wool lb	Lamb lb
1944	8387	16320	10½	20½
1945	8184	Not available	7¾	Not available
1954	26196	49439	22	41½

Approximately two-thirds of the ewes are mated to Corriedale rams and the other third to a fat lamb breed. This season the fat lambs off the mothers numbered 508 averaged 34.2 lb per head, and the balance of 834 fattened on rape averaged 38.4 lb. With the growing of better pastures the ewes at weaning time are all in excellent condition with the result 95 per cent. of the cast seven and eight year old ewes are drafted fat to the works directly after mouthing without further feeding.

Briefly, total wool production has increased from 8,000 to 26,000 lb, or from 10 to 22 lb per acre, that is doubled. While lamb meat has increased from 16,000 to 49,000 lb, or on a per acre basis from 20 to 41 lb.

Through trial and error I have gained a considerable amount of satisfaction from this light land in establishing and maintaining good grass and clover pastures and areas of lucerne. Another pleasing feature is the number of earth worms which have made their appearance, as they never cared to visit me until some ginger was put into the soil.

Although, perhaps I have drifted a little from the subject of wool, production, the growing of good pastures and the maintaining of a healthy flock go hand in hand with the production of fat lambs so does the increasing production of good wool follow; and the old saying still rings true that 80 per cent. of the breeding goes down the neck.

D.—FAT LAMB FLOCK

Mr J. Clark, Tussock Creek, Southland.

Our property of 560 acres is situated at Tussock Creek in the Winton district of Southland some 15 miles from Invercargill. It is undulating country and the soil is a strong silt loam. We get a

fairly well distributed rainfall of approximately 38 inches per annum and by northern standards a fairly long winter.

The Tussock Creek area was settled in the 1870's. The original cover was tussock and mixed bush including red and black pine and clumps of manuka with swampy areas in the gullies. In the early days the settlers were engaged in bushclearing and draining the low lying country to run sheep and dairy cows. The main part of the farm was taken up by our father in 1910 and he bought it from a Mr Tobin who had been there for over 20 years. The original area consisted of 400 acres and at that time carried approximately 600 sheep. An additional area of 160 acres was bought in 1938.

The farm consists of 300 acres of rolling ploughable country and 260 acres of flat. All of it is in good grass except for 12 acres of native bush. The farm is subdivided into 19 main paddocks ranging from 20 to 40 acres in area and most of these paddocks have a natural water supply. Shelter is provided by plantations along the boundary and down through the centre of the farm and this seems to provide good shelter for the stock.

The seed mixture used is:

Perennial rye	15 lb
H.1 rye	10 lb
White clover	3 lb
Montgomery red clover	2 lb
Crested dogstail	2 lb
Timothy	2 lb
Cocksfoot	5 lb
Total	39 lb

The mixture is sown at the rate of 35lb per acre with one and a half bushels of ryecorn as a covercrop. All pastures receive three hundredweight of superphosphate or basic slag and approximately 30 cwt of lime per acre every second year. Each paddock receives upwards of three tons of lime per acre during the three years it is under cultivation before resowing.

We grow swedes and chou moellier for winter fed; ryecorn and rape for lamb fattening. The ryecorn is also used for greenfeed in the spring. Areas for resowing are ploughed and put into swedes. The swedes are followed by ridged chou moellier and after a crop of rape the paddock is sown down to new grass and ryecorn.

The ewe flock is Romney and at present we have some 2,000 ewes, 650 ewe lambs, and 100 others including rams and wethers. We breed most of our own replacements and have been doing so for many years now. Our best line of cast ewes, approximately 400 per annum, are sold down country. The purchaser who has been buying them for a number of years may take two lambings from them and he has had up to 150 per cent. of lambs. Our cull ewes, approximately 150 in number, are sold fat to the freezing works. The Southdown lambs and the Romney wether lambs are fattened and sent to the freezing works. We retain approximately 700 of the Romney ewe lambs. The lambing percentage averages about 115 per cent. and an average of 53 per cent. of total lambs killed go to the works fat off their mothers.

The lamb meat production figure of something in excess of 100 lb per acre has to be considered in a different light to those which you would get from a non-replacement-breeding fat lamb farm. If we deduct the small number of ewes bought in from the number of those sold and then credit the farm with the ewe meat produced we should really add about 23,000 to 24,000 lb meat to the lamb meat production

to give a true picture of the meat production on the farm. It would raise the meat production per acre figure to about 150 lb.

We shear in early November. Lately we have started to shear our lambs, this is done in January. The wool is medium to fine crossbred tending towards fine crossbred and fairly well grown. Wool weight per acre, not including slipe wool, is about 54 lb.

The figures for our production for the last few years are as follows:

Season	No. of Sheep	Lambing %	Lambs fat off mothers %
1950-51	2,400	116	49.2
1951-52	2,300	113.2	52.2
1952-53	2,394	121.3	53.0
1953-54	2,424	111.5	55.9
1954-55	2,570	120	57.0

Season	Lamb meat per acre lb	Ewe meat per acre lb	Wool weight per sheep shorn lb	Wool per acre not including slipe wool lb
1950-51	111.9	—	10.82	47.7
1951-52	105.3	40.6	12.64	53.32
1952-53	113.8	44.7	12.95	56.91
1953-54	Not completed	41.98	12.4	55.33
1954-55	Not completed	Not completed	12.0	56.6

Our death rate has been fairly low and in the lambs, from docking up to June, ranges from three to four per cent. per annum, while ewe and hogget deaths from June to June have not gone above four per cent. and have been as low as two per cent.

Over the past decade, wool production from the fat lamb flock in Southland has been rather neglected. I believe this has been brought about mainly by the higher price paid for lamb meat in relation to returns received for wool over the same period. However, since World War II, the value of wool has increased to a far greater extent than that of lamb meat. According to latest statistics, the wool clip in Southland has risen steadily since the 1949-50 season, when approximately 84,000 bales were offered for sale to 114,000 bales this year. The increase is attributable to the development and improvement of pastures, aerial topdressing of our hill country, eradication of the rabbit and a general improvement in the standard of wool production in our ewe flocks. Now, while these figures give cause for greatest satisfaction regarding wool production, today we face strong competition in the clothing trade from synthetic fibres. However, I believe we have a commodity in wool which can withstand that competition providing we keep the cost of production comparable with the cost of man-made fibres. Let us remember that a reasonable return and an assured market is preferable to high prices resulting in loss of markets.

High wool production can, I believe, be based on four main factors. Although by no means independent, these factors group themselves under the general terms of breeding, feeding, management and handling to sale. High production in a flock is based primarily on the inherent ability of a sheep to produce wool. The mating

of animals pure for high production can be relied on to result in offspring with equally high production. This is true only if the feeding is adequate. Even where wool is the chief consideration, however, selection should not be based on it alone, good conformation, thriftiness and disease resistance are complimentary factors.

Between 200 and 300 of the full mouthed ewes of our flock are selected on conformation and wool from the annual draft. These are mated with the older Romney rams. The balance of replacement-breeding ewes are selected from some 580 four tooths and 560 six tooths and these are mated to younger sires. This gives us a total of approximately 1,200 ewes and it is reasonable to estimate that only some 60 per cent. of their ewe lambs will be required for the replacement-breeding flock. The remaining ewes and all the two tooths are mated with Southdown rams.

It is by no means certain that lambs will inherit the good qualities of their parents unless their parents are pure for these good qualities. Purity is brought about by regularly breeding best to best and by severe culling. Our first culling takes place at weaning time, when any lambs obviously not up to standard are drafted with the wethers for fattening. Again at 18 months from five to 10 per cent. are rejected and sold. Our third and final culling takes place from the two and three shear ewes when our selections for mating are made. On this occasion usually 20 to 25 per cent. will be cast for fat lamb production. If the number of ewe lambs produced fails to fulfil our requirements, we purchase the required number of two tooths.

For many years now all our Romney sires have come from the flock of a noted breeder in the Wyndham district. These have been purchased at the Invercargill Ram Fair each year, and selected primarily for wool production, having due regard for quality, density and coverage, ensuring at the same time that conformation is of the required standard.

I believe the actual performance of any animal is determined by the extent to which climate, feeding and management permit the expression of its hereditary characters. The provision of adequate and balanced feed at all times is most important, particularly for the hoggets and two tooth ewes. Supplementary crops for winter feeding are probably the greatest factor in high production in Southland. Our winter feeding programme normally begins about May 1 when our ewe hoggets receive their first break of swedes and first rack of hay. This diet is continued until early September. We believe in fencing swedes in small areas, to provide a clean break every ten days or fortnight. Our flock of two tooth ewes receives the same ration of swedes and hay commencing about the second or third week in May, however, more use is made of the run off paddock and less time is given on swedes. Hay feeders are placed in the run off and are never allowed to become empty. Ewes of the older age groups begin winter feeding during June, according to condition of ewes and amount of grass still available in the paddocks. This group is fed on chou moellier and as much hay as they require. Unlike the swedes, the time of feeding on chou moellier is rigidly controlled. Half an hour's feeding is allowed during the first few weeks, increasing the time gradually until eventually three or four hours' feeding is permitted daily. Beginning early in August or five or six weeks prior to lambing, all breeding ewes are placed on greenfeed for a few minutes each day. As the month passes, the time allowed is increased but it is largely governed by availability of supplies. We aim to have all breeding ewes back in the paddocks about two weeks before lambing commences, and hoggets by September 1, by which time the first of these begin to lose their teeth. Ewes are placed in their

respective paddocks for lambing at the rate of five and over to the acre. Apart from regrouping at lambing time the ewes are set stocked until weaning. Hoggets are placed at the rate of about ten to the acre. The only other supplementary crops grown are ridged rape for lamb fattening and ryecorn sown as a cover crop to young pasture, and this is available both for fattening and again in early spring as greenfeed for ewes.

Following the weaning of lambs, all ewes are placed on shorter rations, the best pastures being set aside for young stock. However, I do not believe in the autumn starvation method as practised by so many flock owners today, as I consider this period from weaning until tupping is the season of greatest wool growth, and this can be greatly retarded if a reasonable supply of feed is not available.

A 20-acre paddock is set aside each year for hay production. This is usually closed up about the end of October and harvested in late December. In a normal season this produces 2,000 bales which are harvested with a roll baler. This method of baling we find has many advantages both for harvesting and feeding out.

Production of wool does not end with growing the fleece. So many clips are lowered in value by careless handling at shearing time. Surely the need for a little more care in handling such a valuable commodity should be apparent to all growers, for the increased return will more than compensate for the extra time spent.

In conclusion, I believe the future of the wool industry is in the hands of the producer. The threat of synthetic fibres is forever before us, so let us resolve to increase our production and to improve our quality. We must endeavour at all times to maintain a reasonable level in production costs, and bring not only increased returns to our own section of the community, but added prosperity to the nation.

DISCUSSION ON FARMERS' PAPERS

Merino

Mr Fahey, South Otago: Has the control of rabbits anything to do with the production increase?

Mr Urquhart: No. There have always been some rabbits but they have never been numerous on this country.

Mr Hunt, Chairman: What type of rams were used to breed away from "sand rubbers"?

Mr Urquhart: The type of sire used is of medium combing 64/70s. In the past many of us favoured "dark tippers," but in my experience dark tipped rams will usually rub and therefore will come in without the dark tips.

Halfbred

Mr Evans, North Canterbury: Has Mr Cran anything to add to Mr Urquhart's experiences in breeding non-sandy sheep?

Mr Cran: Avoid excessive greasiness. Aim for short, sturdy, free wool growth and a close-woolled back. I certainly agree with Mr Urquhart that black tipped rams usually become white.

Mr Whittlestone, Otago: Has the speaker any experience with the Romney-Merino Halfbred? How do they compare with the English Leicester-Merino Halfbred?

Mr Cran: We have done no experimenting with the Romney simply because we cannot keep pace with the demand for our original English Leicester-Merino Halfbred.

Mr Anderson, Mid-Canterbury: Mr Cran gets a better lambing percentage from the English Leicester ewe than from the Merino ewe. Do their respective progeny show the same variation?

Mr Cran: Quite definitely no.

Corriedale

Professor Flay, Lincoln College: I would like to ask Mr Bethell if he has reached his potential production? If he does not have to grow winter feed must he not be understocked?

Mr Bethell: I am not carrying the stock I could carry. I very much doubt if the economics of it would be worth while. For one thing, if I carried half as many sheep again I should have to build another cottage and employ two more men. I should have to do some arable farming. However, I am growing 20 acres of green feed next year!

Mr Hurst, Papakaio: Do you experience any trouble with barley grass?

Mr Bethell: Yes, barley grass is present. I have found that heavy grazing will help to control weeds in lucerne. I tried it as an alternative to cultivation. I do not think it is a unique experience —a dairy farmer had a similar experience when he fed out on a very weedy lucerne paddock.

Mr Hunt, Chairman: Mr Askin made mention of an annual application of D.D.T. How is this applied?

Mr Askin: As D.D.T. super as supplied by the works.

Fat Lamb

Mr Bevan, Meat and Wool Boards' Economic Advisory Service: Mr Clark mentioned an increase in the wool clip. That increase was mainly an increase per head in the wool shorn. Does Mr Clark think he has reached the limit of wool production? If not, does he think it would be best to increase wool per head or would it be more wise to increase flock numbers?

Mr Clark: I do not think we can hope to increase wool weight per sheep without deterioration of the lamb situation. Very often ewes that give the best wool are not such good mothers. However, with more sheep per acre there are other troubles and it may be best to look to cattle to control the situation.

Mr Samson, North Canterbury: I would like to ask Mr Clark if he has foot-rot on his place and by what means he controls it?

Mr Clark: The losses from foot-rot are not as great as people consider. Every precaution is taken to put the ewes through the shed prior to tupping, and specific cases are hand-dressed. I make use of a foot-rot bath, but to trim every foot would be too much.

Mr Grant, Waimate: Does Mr Clark think that by increasing wool clip per head he is losing milking ability of his ewes?

Mr Clark: Difficult to say without conducting a series of trials. Our ewes certainly are producing heavy fleeces but our lamb weights this year for three drafts of shorn Romney lambs have been 40 lb, 39 lb and 38½ lb. It seems that we have not yet arrived at a stage where milking ability is affected.

5. WOOL FAULTS

Dr A. E. Henderson, Lincoln College.

From one point of view it can truthfully be said that all wool, whatever its colour or characteristics, is good for some purpose or other. Short, stained locks have their place in the trade, on a footing which is not so different from that of the best crossbred or fine wools grown. It is therefore logical to ask why there are such large differences in price between kinds of wool if each and all of them have a definite use and are ideal for some purpose or other. There is no real difficulty in arriving at an answer. We almost always use the price we get for our wool as the measure of excellence and this price is determined, first of all, by the demand for and the selling price of the finished article, and, secondly, on the money the manufacturer has to spend in manufacturing. The farmer is quite right in using price as a measure of excellence but there must be one reservation. The important thing is clean price. No one yet has been paid for grease and dirt but because nearly all our wool is sold greasy and the price we get varies with the amount of grease and dirt, the presence of these things often clouds the issue.

The things about wool that give it excellence are fairly clear to the practical man although the scientist has great difficulty in defining and measuring these same things. The things that matter most are good length, because it gives strength to a yarn and allows finer yarns to be spun; soundness, because it lowers the amount of short fibre that has to be diverted to fabrics with a lower selling price; colour, because whiteness gives maximum scope for utilisation; well defined and even crimp, because this is a first-class indicator of evenness of fibre diameter and fibre length within the staple; and lastly, we can mention good handle or softness which is a most difficult thing to define but which is most important.

Although all wool can be used it is to the advantage of a farmer if his particular wool is among the wools that bring the higher prices. Fineness, of course, has a very great bearing on price but on this occasion we should confine our discussion to the part played by excellence. Now, how much of our wool is faulty; what is wrong with it and, finally, what can we do about it?

From a trade point of view it seems that on an average something less than 10 per cent. of our fleece wool is classified as "Spinners and Super Topmaking." Wools of these descriptions can be regarded as offering the greatest scope and economy in manufacture and for all practical purposes can be described as free of fault. Sixty to 70 per cent. of the clip is classified as "Good/Average Topmaking" and these wools have various manufacturing limitations. Between 20 and 30 per cent. of fleece wool is described as "Average/Inferior Topmaking," and these latter wools have serious manufacturing limitations. It is obvious then that only a small part of our wool clip is as good as it can be.

Now, what is wrong with this wool? A detailed survey involving more than 80,000 fleeces from all parts of New Zealand has disclosed that apart from short staple length and poor crimp, which in themselves detract from excellence, some 55 per cent. of all fleeces examined had a recognisable discoloration or defection. Nearly one-third of these fleeces had two or more recognisable faults. It is probably true to say that the majority of the wool that fails to meet the standard of the 10 per cent that is graded as "Spinners and Super Topmaking" is too short and lacks crimp or style. It may or may not have other things wrong with it. Now we know that feeding has a very great influence on length and style. It can be said therefore

that if the sheep that produce this average grade wool were better fed then their wool would be of higher grade. This statement is so obvious and sensible that it might be thought superfluous; nevertheless it draws attention to a situation that calls for great skill on the part of the farmer—a situation where the farmer has to balance carefully rate of stocking and the levels of per-sheep and per-acre production, so that his total farming operation shows the greatest return. No one is in doubt that the production of very high grade wool is expensive, not in cash outlay but in low rates of stocking and restricted production of other farm commodities. If these restrictions are practised in order to grow top grade wool, then there must at the end be a reward, otherwise there is no incentive and until there is an ensured reward there is little chance of increase in the proportion of super wools in the New Zealand clip.

A fault almost always associated with shortness and poor style is wool break, or tenderness, which recognisably affects between 45 per cent. and 50 per cent. of fleeces. From work done at this College by Hart it is clear that light/dark ratios have a profound effect on rate of wool growth. For instance, sheep that remain at constant weight will produce in each of the months of December, January and February approximately three times as much wool as they will produce in each of the months of June and July. There is little doubt that this low rate of growth in June and July leads to a break. If sheep are well fed in the June-July period then the amount of wool grown is greater and may reach approximately half of the quantity grown in the mid-summer months. It is obvious then that good winter feeding will do much to prevent not only the occurrence of break but also shortness of staple and lack of style which are consequences of a fluctuating wool growth rate.

While break is an important defect in itself it also leads to or sets the stage for the occurrence of other faults. A cotted or matted fleece cannot occur unless there is first a large number of loose fibres in the fleece and this always happens with the occurrence of a recognisable break—indeed, this is the "break." These loose fibres may not entangle to form a matt but if there is fairly frequent wetting of the fleece then a matt of some sort is likely to form. On an average approximately one in seven fleeces is matted or cotted to some degree. Disentangling the matted mass requires labour and machinery and the process results in much fibre breakage so that cost of manufacture is increased and the wool fibres themselves have a more restricted use.

A point of great interest is the positive association that exists between a fault we know as "hairy tip" and both "break" and "cotting." In other words, these faults tend to occur very frequently in the same fleece. There is a particular association with cotting and this is of particular interest. Most forms of "hairy tip" are strongly inherited, therefore judicious selection of breeding stock must influence not only the incidence of "hairy tip" but also "cotting" and to some extent "break." Among Romney and Crossbred sheep one fleece in thirteen has a hairy tip. I regard selection against "hairy tip" as being one of the most worth-while means whereby the average grade of the wool clip can be raised. Unfortunately it is usually almost impossible for selection to be effective. Ewes are culled at a time when they have too little wool to make the fault obvious and rams are almost always offered with the tips of the fleece carefully removed. In these circumstances it requires a very penetrating inspection before a hairy tipped and potential cotted fleece can be positively identified.

Next in importance, so far as incidence is concerned, is "dinginess." In Romney and Crossbred, in Threequarterbred and in Corrie-

dale and Halfbred fleeces an average of one fleece in eleven can be classified as dingy. The appearance of the fleece is spoiled by the presence of excessive dust or sand, or by log or bush stain. One never finds these fleeces in the top grades, no matter how well grown and fundamentally good the wool may be. I suspect therefore that the farmer who produces this kind of wool is perhaps penalised in two ways: firstly, by a low yield and secondly, because the greasy wool is very dirty and unattractive to look at. There are possibly two solutions to this problem. If much of our rough sheep country is to be used at all then there will always be opportunity for much of our wool to become dingy. Accepting this one obvious way round the question is to scour this wool before offering for sale. The wool should then sell on its own merits.

The second solution is a much more intriguing one. You have heard Mr Urquhart describe his success in reducing the incidence of sandy or dingy fleeces in his flock. He has done this by selection and his selection and breeding policy is based on the recognition of a particular kind of wool. If by appropriate selection methods this particular wool type were to become widespread in our high country —or, indeed, on any dirty country, it could result in one of the most spectacular achievements of the sheep farmer in producing a fleece thoroughly adapted to a particular set of environmental circumstances.

To a large extent the work done by Mr Urquhart has had the same objective as much work which is being done at this College. Here we have been interested in "fleece rot" among fine-woolled sheep; Corriedales, Halfbreds and Southdowns. There are many forms of "fleece rot" but green, brown, blue, pink and yellow stains can be listed, with less frequently a certain amount of actual rotting of fibres. The overall incidence of these faults in the New Zealand clip is not high, and is usually about five per cent. However, in some areas and in some seasons a very great number of fleeces may be affected and staining may be serious enough to lower grade very appreciably. At present prices it may cause a loss of some sixpence per pound so that the problem can be of great significance to some farmers. These faults are the result of wetness within the fleece for periods exceeding at least three days on end.

We have endeavoured to discover the reason why some fleeces are never affected by "fleece rot" and have reached the stage where we can recognise a type of wool that is almost immune to it. It has been discovered that such fleeces dry much more quickly than others but we have yet to find a difference that can be quickly measured. It is of some considerable interest that the fleece type resistant to fleece rot has, as far as we can tell, the same features as the fleece resistant to sand and we have the opinion, as yet not thoroughly proved, that the desirable fleece type is fairly strongly inherited. It should be possible, therefore, to be successful in selecting for and breeding sheep with this type of wool.

There is much more about these individual faults that could be discussed and there are many more minor faults that could be mentioned. However, there are broader issues that deserve attention. We have recognised that only some 10 per cent. of our wool can be described as very good, and that some 20 to 25 per cent. is definitely poor. Some of the reasons why this wool is regarded as poor have been explained and discussed. At one time or another you have probably noticed all the faults that do occur in wool, but it is unlikely that you have realised the collective significance of wool faults.

Faults can, I think, be divided into a number of categories. There are wool faults that are due to nothing less than carelessness

and it is amazing that such a valuable product should be carelessly handled. There are faults that are due to feeding and management and these are problems for the individual for they are associated with achievement of an overall production efficiency to which wool is only one of a number of contributors. Next, there are faults that have a fundamental cause in breeding and hairy tip is one such fault to which much more attention could be paid. Fortunately, others such as hairy britch and kempy fibre are fairly efficiently dealt with.

There are faults that are the result of inability of the fleece to look after itself. If all wool remained as good as when first produced our wool clip would grade a great deal higher than it now does. A fleece is important in two ways: it is necessary for the well-being of the sheep but it should not be so large and cumbersome that it interferes with the sheep. Secondly, it is part of the farmer's reward and it is he who requires it to be large and of high grade. The less effort the farmer has to make in achieving these things, the more profitable the farming operation. The weather and rough country are the worst enemies of a fleece and we cannot do much about altering either. We should therefore look for and select and breed a type of fleece that can withstand the bad effects of either or both of these natural hazards. This will not be easy but it has become apparent that it can be done in Merinos and in Halfbreds and Corriedales. There is good reason to believe that it can also be done among Romneys and Crossbreds. We should clearly understand that this involves breeding a type of fleece particularly suited to certain climatic or other environmental circumstances. It is the chief aim of any farmer to have the kind of stock that will thrive best on his country. This is right and proper but illogical argument is too often used when making a choice of strain or breed. Because wool is easy to see, the kind of wool a line of sheep have often governs the choice. It is true that on a broad basis physiology and behaviour are associated with kind of wool, but it is not true kind of wool confers on the sheep some particular ability or other, because within breeds, fine or coarse wool, long or short wool, or any other fleece characteristic for that matter, contributes little or nothing to the ability of the animal itself to thrive. It follows, then, that within a breed selection for a kind of fleece can be practised independently of selection for other physical features.

Lastly, I should like to draw attention to a fairly general cause of mediocrity in wool. There are some who judge productivity of their sheep by the amount of wool they produce rather than by the amount of money that is obtained for the fleece. On the average, coarse fleeces are heavier than fine fleeces and the difference is usually about one third of a pound for one count change. In round figures a 52s fleece of 10 lb is worth as much as a 46s fleece of 11½ lb. A 58s fleece of nine lb is worth as much as a 50s of 12 lb. If the significance of these figures is forgotten then there is a great preference for the coarser woolled sheep of any breed. In addition there is a fairly widespread practice of selecting flock rams having a kind of wool one would like to grow and often preference is given to a coarse bold type of fleece. For various reasons, most of them technical, a bold coarse wool of any breed requires a very high level of feeding and management before it can hope to be good enough for the higher grades. On the other hand the finer wools of any breed, providing they are not fuzzy or spongy, will retain style and appearance under hard conditions and these are things associated with the fleece itself, not the sheep. It is advisable, therefore, that selection of coarse wools be avoided unless conditions are such that sheep can be consistently well fed and heavy fleeces can be produced.

6. THE PATTERN OF WOOL PRODUCTION IN NEW ZEALAND

Mr F. L. Ward, N.Z. Meat and Wool Boards' Economic Service.

During the last fifty years there have been great changes in the pattern of our wool production. We have more than doubled our wool output and we are producing a very different type of wool from that which was grown in the early days of our industry. The wool, too, comes from a different type of sheep, and from a different type of farm.

The story behind these changes lies in the progress and development of farming in this country. The evolution from the extensive grazing systems of the past, involving large areas and relatively few sheep, to the fairly intensive system of farming in vogue today. We have seen the change from the time when wool was practically the only exportable commodity to the era of the frozen meat trade with its dominating influence on the sheep industry of New Zealand.

In 1900, when sheep numbers were 19 million, our wool production was 140 million lb (greasy), worth about £4 million and this has increased to 425 million lb (greasy) recorded for the past season and worth about £80 million. The annual wool clip on a per head basis would be about seven pounds At the present time after allowing a deduction for slipe wools, it is approximately nine and a half pounds per head from 38 million sheep. It is interesting to note the increase in the proportion of breeding ewes in the flock. In 1900 approximately 50 per cent. of the sheep were ewes, whereas today they represent 66 per cent. or two-thirds of the flock.

The increase in sheep numbers and in quantity of wool produced has been accompanied by a change in the class of sheep and composition of the total flock. In the early days of the industry the Merino was the predominant breed, whereas today the Merino accounts for less than two per cent. of the total clip. Crossbred is the predominant wool today, as shown by the following percentages:

Season	Counts	Percentage of Total Clip
1953-54	60/64 up	1.5
	50/56 to 60's	23.75
	50 and lower	74.65
		100.00

This of course does not tell the whole story as the Merinos have had a very big influence on the type of sheep in use in the South Island today. The big holdings of the past have been sub-divided into smaller properties and even at the present time the number of farms is still increasing, indicating that the process of development of smaller and more intensive holdings is still going on. At the present time the wool is coming from a large group of farms and not from relatively few wool properties as in the past. There are

approximately 36,000 sheep owners in New Zealand and two-thirds of them own less than 1,000 sheep.

This situation has its problems, and among them is the greater variation in the wool. These small clips are very difficult to make into worthwhile lines on the farm, and consequently we have seen a great increase in the amount of binning in the wool stores and about 60 per cent. of the total wool clip is handled in this way.

The wool we produce comes from a wide range of country varying from the high altitude snow risk country of the South Island, to the high producing intensive fat lamb farms of both islands. In order that we may more easily study these sheep farms in relation to their wool production it may be more convenient to sort them out into five main groups, as is done in the Farm Survey being carried out by the New Zealand Meat and Wool Boards' Economic Service.

First we have what we call our Class I properties, where probably 90 per cent. or more of the revenue comes from wool, and where the sales of surplus stock are somewhat irregular. These are mainly the harder types of high country runs in the South Island, and the sheep are predominantly Merinos.

The Class II properties have a greater income from surplus stock, but even here, the income from wool is likely to be 80 per cent. or more of the total income. This latter group includes the rest of the South Island high country and some of the low hill country of the North Island.

Then there is the Class III section which includes the easier hill country of both islands. This group gets the greater part of its income from wool, although surplus stock (sheep and cattle) plus some fat stock are also very important.

Finally we come to the intensive farming groups. The fattening farm which is our Class IV, and the mixed cropping and fattening farm, which is our Class V group. In the case of the fattening farm we still find that wool is very important financially: for a number of years it has been responsible for nearly half of the income. Wool is also an important source of revenue on the mixed cropping and fattening farm.

I mention these percentages in order to stress the importance of the wool crop to all sheep farmers. The wool men of our high country runs do not need to be reminded, as they know how important their wool clip is to them financially, but I wonder if they are not being influenced too much by past experiences.

At a period of disastrously low wool prices many of the high country runs attempted to get some income by breeding a type of sheep acceptable to the down country farmer. This in many ways was not in the best interest of the runs and the use of unsuitable sheep led to inefficient and bad use of the country. Some idea of the wool prices which led to this state of affairs is given in the following figures. In the period 1934-38 the Merino wool price for all types and styles was 14.2d. In 1953-54 the figure for comparable wools was 62.57d. With the change in the situation due to the improved wool prices there still may be too much emphasis placed on the returns from the sales of surplus sheep and the suitability of these sheep to the down country man. It is only on the better class of runs that there is likely to be as much as 20 per cent. of the revenue coming from this source and the average is more likely to be 10 to 15 per cent. The suggestion is that wool should have real priority and this could perhaps be achieved with very little effect on the returns from surplus stock. It is possible that run holders are compromising by

breeding a sheep not wholly suitable to their country, but which is saleable when cast. The point I make is, that it would take very little improvement in the wool quality and quantity to have a financial effect which would more than compensate for a possible loss in revenue from the sales of surplus sheep.

We could now turn to a consideration of suitability of sheep to country and while there is a fairly wide range of adaptability in each of our main breeds, we could not for example expect to make a Romney ewe happy on our South Island high country. But when it narrows down to a consideration of Merinos, Halfbreds, and Corriedales for this country we are not so sure of our ground.

We could perhaps think of our runs as being in the following groups in order to discuss a part of the question:

1. Hard country, low lambing percentages, no culling possible in young stock, and practically none in older animals.
2. Medium run country, lambing still too low to permit culling of young stock but can sell a fair number of older sheep.
3. Good country, good lambing, can cull before young sheep go into the flock and also as cast for age sheep.

In 1, the sheep have to be very true breeding in order to maintain flock quality and the only control is by ram selection. In 2, ram selection is still the main factor, but it is possible to keep better control of the age composition of the flock. In 3, ram selection is still important. Flock evenness can also be achieved by culling.

In the first two cases, as surplus stock are not important factors, there is no need to consider the needs of other farmers, and wool should be the only consideration. In the third case, it is quite obvious that it will be in the interest of the owner to consider the needs of buyers of his surplus sheep. These three examples serve to illustrate some of the factors to be taken into account when considering the suitability of sheep to country. It could be fairly said I think, that the Merino would give a better performance in the first two cases quoted. We also know that certain animals produce better wool than others under the conditions in which they find themselves.

Even in a reasonably uniform flock there is a fairly wide range of wool quality and style; a close investigation of the wool clip will pay dividends in establishing the type of wool which shows up best in the prevailing conditions. There is a wide range in the weight and class of wool produced by individual animals in any flock, but a study of these factors would call for a detailed examination not possible unless undertaken as a research project.

On the intensive farms more attention could be directed towards the wool. On the fattening farms in particular, it is very often regarded merely as a by-product of meat, whereas it may be an item of almost equal importance in the total income.

What means lie within a farmer's power if he wishes to improve the quantity and quality of his wool?

The first requisite is adequate feeding, and one of the best indications of the level of feeding on the farm is the wool produced on that farm. Run holders will say that this is one of the factors very largely out of their control as it is so often a matter of weather conditions, and we know that adverse seasons can affect wool up to the extent of one pound or more per head of sheep shorn.

But is it completely out of our control? Shortage of feed in some areas is caused by a heavy infestation of rabbits. As a result of positive action on the part of property owners in these areas a quite remarkable increase in wool production is taking place, an

increase per head of sheep shorn, and an increase due to a greater number of sheep being present for shearing as can be seen from the following figures: In one case, we can quote an increase of from 16,000 lb of wool in 1950-51 to 21,000 lb in 1954-55 with a rise per head from seven and a half to eight pounds. Another rose from 67,000 lb to 86,000 lb in three years accompanied by a per head increase of from eight to nine and a half pounds. A third property also over a period of three years increased the wool clip from 22,000 lb to 26,000 lb, and here the increase per head was from seven and a half to nine pounds of wool. These increases took place mainly as a result of rabbit eradication. We can also quote a case in reverse where an increase in the rabbit population, through no fault of the owner, caused a drop from 30,000 lb of wool to 22,500 lb in three years.

Some considerable effort is being made, and should be made towards the improvement of winter country by aerial topdressing and seed sowing, and by cultivation and sowing of suitable areas. Fencing, too, is now financially possible, and is usually an essential part of an improvement programme. This improvement of winter country is of paramount importance as it affects the breeding ewe and could be reflected very favourably in subsequent lambing percentages. It will also have its effect on the growth and development of young stock. On the easier hill country, topdressing by air is becoming standard practice and a quarter of the total area topdressed in New Zealand is done in this way.

The result of better feed can be measured in terms of increased wool production, and I quote a South Island case where a hill country man on what was regarded as low fertility country has achieved outstanding results. In 1942-43 he set out to increase his wool production by improving the small area of flat which amounted to about 10 per cent. of the area of the property and in six years this has been completed. Over the six years the wool clip had increased by 50 per cent. and stock numbers by 20 per cent. In 1949-50 he started on the hill country with aerial topdressing and oversowing, and this aerial topdressing is now an annual operation. The wool clip from 1949-50 to present date has increased by a further 50 per cent. It is interesting to note that the wool weight per head of sheep shorn has risen from just under eight pounds in 1942-43 to 11½ pounds at the present time. The sheep numbers have increased by 50 per cent. over the period, the wool clip has been doubled, and the job is still going on.

The intensive farms on the lower country have it in their power to produce feed for their stock all the year round by growing crops or saving grass paddocks for out of season use. High production figures for wool and meat per head and per acre are being recorded on farms in our survey where the level of feeding is high. Returns of over 200 lb of lamb meat and 50 to 60 lb of wool per acre are not uncommon on some of the better Southland farms.

Another question is that of wool quality and style, and it should be a matter of some concern that so much of our wool goes into the lower grades owing to various faults. Dr Henderson tells us that some 80 per cent. of our wool is faulty in one way or another. Many of these faults may be due to:

1. Inadequate and faulty feeding.
2. Indifferent breeding, or
3. Unfavourable weather conditions.

It must be realised, too, that wool may suffer in appearance after it has been removed from the sheep through indifferent handling in the shed.

This important question of wool faults is being dealt with by other speakers at this Conference. It is apparent that in the future our wool clip will increase in quantity as our sheep population rises, but will it improve in quality? There are many wool faults for which as yet we do not know the answer, but surely a product which today brings us £80 million per annum to New Zealand is worth considerable attention in our endeavour to make certain that its quality is of the highest attainable.

For the last 30 or 40 years the increase in our wool production has followed on the sub-division of our runs and farmland and the development of intensive styles of management. Today this hill country is making a rapidly increasing contribution to the national wool clip as a result of the progressive outlook and efforts of our farmers. They have made good use of recent research work and investigations and were quick to realise the value of aerial top-dressing as shown by its rapid expansion.

We can see from this study of the changing pattern of our wool production that we came from the hills, we moved to the low country, and we now turn to the hills again for our next phase of expansion. The hill country will make a steadily increasing contribution although results may not be so spectacular as they have been on the farms, due to difficulties of terrain and greater harshness of climate at higher altitudes, but this increase will come, and with gathering momentum.

DISCUSSION ON TWO PREVIOUS PAPERS

Mr Laidlaw, Marlborough: Firstly I agree with Dr Henderson that "faults" can be bred out by selection. Personally, I was very surprised to hear "handle" put so low down in the virtues of wool. If wool has good handle it has almost every other virtue.

Secondly, how about "devil's grip"? The fibre in that area appears to have characteristics not easily seen, or not seen at all with the naked eye. Is "devil's grip" a bad fault?

Finally, does it pay to shear the stockings? If so, would it be better to put them aside?

Dr Henderson: Although I mentioned "handle" last it is important, but being a scientist I am not very satisfied about it because it cannot be measured by mechanical means. Nor can the individual repeat his judgment accurately enough to be worthwhile except in a very few cases where the fleeces are of outstanding softness or harshness. If you were to put 100 fleeces into very good, good and poor classes on "handle" and were to judge the same 100 tomorrow, you would not have much more than ten per cent. of your fleeces in the same groups. You would change your mind over about 90 per cent. of them. However, there are about five to ten per cent. that you would recognise every time.

As regards "devil's grip," it is quite distinct from fleece rot and does not appear to be important.

If the wool is of low grade it does not matter whether the stockings are taken out or left in. Of course, in good lambs' wool take them out every time otherwise the wool will be downgraded. It would be preferable not to shear the stockings at all.

Mr Samson, Marlborough: I wish to make a contribution to the wool problem. Referring to a book that Mr Bevan sent me through the post, I see our sheep farming statistics total 38 million sheep, that is 25 million ewes, nine million hoggets, four million wethers and other sheep. Years ago there were a large number of wethers in the national flock and naturally the clip was better. Today the

ewe number has increased out of proportion and when a ewe has to rear a lamb there is a considerable strain on her. The showman knows it is very difficult to get wool in good condition on ewes with lambs at foot. With large ewe numbers we cannot expect to get good wool.

Dr Henderson: If farmers want maximum returns it is obvious that it does not pay to grow a 14 to 15 lb fleece. With a larger proportion of breeding ewes in the national flock we cannot expect all wool to be in the top grade. However, 20 to 30 per cent of our wool is much below average. This could be improved upon by: (1) Rigid selection against hairy tip, (2) attention to Mr Urquhart's principle of selection, and (3) similar selection to avoid fleece rot.

Mr Carr, Mid-Canterbury: What effect has the shearing of wet sheep on the wool?

Dr Henderson: The points about shearing wet sheep are these: Every fleece is loaded up with bacteria and under suitably damp conditions the bacteria will become active and rot the wool. If you shear wet wool and bale it up or even put it in the bin, a certain amount of rotting will go on. It will get hot and there will be a distinct smell of ammonia. During the process it loses colour and therefore loses grade. The manufacturer will suffer further loss because the rotting causes some three to four per cent. loss during machine operations.

Mr Bevan, Meat and Wool Boards' Economic Advisory Service: Dr Henderson and Mr Urquhart have brought out the fact that a great many faults which are associated with field conditions have a hereditary basis and can probably be bred out by the studmaster. These are perhaps the greatest discoveries of our wool era. I wonder whether Lincoln College might not lead the way by selecting and breeding fault resistant sheep in its studs?

LUCERNE AND ITS PLACE IN SOUTH ISLAND FARMING

1. DEVELOPMENTS IN LUCERNE OVERSEAS AND THEIR POSSIBLE APPLICATION IN NEW ZEALAND

Mr C. E. Iversen, Lincoln College.

A considerable amount of research work with lucerne is evident in England, France, United States and Canada. Some interesting personalities are to be found in this field and an account of their activities is of interest to New Zealand.

Until fairly recently lucerne was just lucerne (or alfalfa) but with the spread of the plant to less suitable localities, disease and the affect of adverse environment have high-lighted the need to obtain new sources of plant material. Consequently, it is desirable to know what material is available. A further reason for understanding the background of the world's strains of lucernes is the world-wide problem of seed production which results in all except the most favoured localities having to import seed from time to time. An account of the characteristics of the three main species is given in Table I.

TABLE I

Lucerne Species

Species:	1. **Medicago sativa**	2. (1x3) **M. media**	3. **M. falcata**
Name ..	Common	Variegated	Yellow flowered
Flower ..	Purple	Variegated	Yellow
Habit ..	Erect	Semi-erect	Prostrate
Root ..	Tap root	Some branched roots	Many branched roots
Leaflet ..	Long and wide	Short and narrow	Very short and narrow
Productivity	High	Medium	Negligible
Earliness ..	Early	Medium	Late
Winter hardiness	Poor	Good	Excellent
Disease resistance	Poor	Good	Excellent
Chromosomes	32	32	16

Lucerne originated in Asia Minor, *M. sativa* being found in the warmer climate of the lowlands and *M. falcata* in upland areas. *M. media*, a hybrid form, is an intermediate type. Further crosses and back crosses between these species give us five main strains as shown in Table II.

The classification of the natural strains is easily followed from their historical background. Lucerne first spread to Greece in 470 B.C. and later to the Roman Empire. It acquired its name from the valley of Lucerne. This introduction was of the *Medicago sativa* type. Other emigrations brought in the *M. media* species and crosses between them. Thus in Europe we find fairly pure *M. sativa* types such as Provence, *M. media* types as in the German and Poitou

strains and intermediates such as the Flamande strains. Another line of emigration was across North Africa and to Spain under the Moorish influence, whence it received its name of alfalfa. This was a fairly pure *M. sativa* type. Spaniards introduced alfalfa to Chile in Elizabethan times and from here it spread across the Andes to Argentina and Uruguay and also north to Peru. Here lucerne found a suitable home and some 17 million acres are devoted to its culture, nearly 40 per cent. of the world's acreage.

TABLE II

Classification of Natural and Bred Strains.

Medicago sativa	**M. sativa x M. media**	**M. media**	**M. media x M. falcata**	**M. falcata**
Natural strains—				
Hunter River	Flamande	Grimm	(Cossack)	Don
Argentine ←	Marlborough	Ontario variegated	(Ladak)	Siberian
Provence →			*Turkestan*	
Sth. African		Baltic	Nomad	
American		German	M. glutinosa	
Common		Poitou		
Bred strains—				
(Buffalo)	Du Puits	S. 205	Nemastan	
Saladina	Strain B.	Hardigan	*Ranger*	
Talent	Atlantic		*Vernal*	
			Rhizoma (Creeping rooted)	
			← Narragansett	

Strains in italics are wilt-resistant, those in brackets are moderately wilt-resistant.

The gold rushes in California took Chilean alfalfa to western America. Here the plant found perhaps its best home; hot sunny days, cool nights, mild winters, a deep soil rich in calcium, phosphorus, potassium and trace elements, freedom from disease, and high seed production. Inoculation, liming and fertilisation were unknown and unnecessary. Lucerne did not spread widely in the eastern states for many years as winter cold, acid soils and deficient minerals did not encourage its use. A series of droughts in the years 1927-36 aroused interest in lucerne and a new empire of some 10 to 12 million acres developed in the middle west. This time it was no simple process of letting the area develop. It was a triumph of the agricultural scientist over extraordinary difficulties. Firstly, to overcome the unsuitable environment, seed bed preparation, inoculation, liming and adequate fertilisation were required. Secondly, winter-killing: the non-hardy, *M. sativa* type from the west was of no use, but an introduction of a variegated lucerne by a German immigrant, Wendelm Grimm, and of an Indian strain, Ladak, gave the answer to this problem. Next came the disease bacterial wilt, which was partly answered by using the Caucasian strain Cossack, and Ladak. Turkestan, another Caucasian strain, while low in production had excellent wilt resistance. A combination of these has given rise to very resistant strains in Ranger and Vernal. Other pests and diseases created problems to be met by choice of new strains or by breeding to the hardy *M. falcata* parent. It was due to the enthusiasm of an early plant explorer, Dr N. E. Hansen, that this material gathered in Russia and Asia Minor about 1909, was available in experimental

station nurseries. It is thus apparent that where no problems arise *M. sativa* is the principal strain used but where any degree of hardiness is called for, more or less *M. falcata* blood is indicated. Put another way—where the environment can be fitted to lucerne, *M. sativa* strains are used. Where lucerne has to be fitted to the environment, then *M. falcata* crosses are required.

The *M. sativa* strains are classified as non-hardy. This includes Hunter River, Argentine, South African, Provence and American Common. When our seed stocks are in short supply these are our main centres for obtaining seed. Some of them are not satisfactory for South Island use.

Our own Marlborough is usually considered to be a Provence type, although first supplies came from Argentine. However, it exhibits a great deal more variegation and is superior to many of the pure *M. sativa* types for our environment.

The division of strains in Table II is somewhat artificial in that lucerne is a cross-pollinated plant and is probably capable of more change in an environment than any other field crop. A good example of this is given by Buffalo, a wilt-resistant strain developed from Kansas Common, a pure *M. sativa* type. It is the only wilt-resistant *M. sativa* known.

Lucerne seed is usually taken from old thinned-out stands in which only one out of 100 of the original plants survives; consequently major changes can occur in a strain.

At Cambridge in England, vigorous testing has been carried out on a world collection of strains by Zaleski. There is a severe winter climate, the soils are often water-logged and there can be severe summer drought. The non-hardy *M. sativa* types do not show up at all well. Zaleski found a close correlation between total production, spring earliness, autumn productivity, earliness of flowering, growth habit (erect to prostrate) and size of leaf (large to very small) in which the rating of strains was Flamande, Pedigree Marlborough, Marlborough, Provence, Hunter River, Argentine, Grimm, Rhizoma and Nomad. Winter mortality of Provence, Hunter River and Argentine was severe. Zaleski considered the test of a good variety to be early in spring, early flowering, productive in autumn, erect, with a long, wide leaflet. At his station, Flamande types were easily superior. Fault may be found with their stemmy nature, but for North Island areas where grass invasion is a severe problem, the early and late growth of this type is a strong deterrent. In Lincoln trials, Du Puits (Flamande) shows these characteristics but is not markedly superior. It would probably give an extra cut. Flamande lucerne does not stand grazing. In yield trials in England, France, Holland, Denmark, Sweden, Oregon and Ontario, Du Puits outyields other varieties for the first two years. After that it may become weakened in unfavourable environments.

In some of the East Coast areas of England extensive use is made of lucerne for grazing. Near Newmarket on arid sand is the 23,000 acre Elveden estate of Lord Iveagh. About 9000 acres have been reclaimed from rabbit and scrub. The rotation is lucerne and cocksfoot (three years)—wheat—barley—sugar beet—barley. There are 3000 acres of lucerne, 500 acres meadow and about 5000 acres of crop. The stock is 500 dairy cows, 800 heifers, 800 beef cattle, 3000 sheep and 100 sows. The seeding rate is 18 lb lucerne and one pound cocksfoot. The pastures are cut or grazed three times a year, the electric fence being used to ensure complete utilisation and prevent back grazing. Neither the stock nor the pastures suffer from grazing. Milk production is 850 gallons per cow.

William Davies, Director of the Grasslands Research Station at

Hurley, has as an aim the production of year-round pasture. Lucerne features strongly in his programme for high summer production. He believes in a non-competitive companion grass as it increases yield and palatability and keeps out sward forming grasses such as ryegrass, *Poa trivialis* or browntop. Cocksfoot, timothy and meadow fescue are used at two pounds, the choice depending on the rainfall. The pasture is spring sown and is lightly grazed two months later and again in the early autumn. It is allowed to go into winter with a good growth to build up food reserves in the roots. This is grazed off in mid-winter to clear the lucerne crowns of shade. Lucerne requires an open sward, a heritage of its semi-arid history. The spring growth on an established stand is usually cut for hay or silage but may be grazed provided that six weeks' rest is given between grazings. The aim is to build up strong root reserves against the heavy grazing of midsummer. He stresses the long rests between grazings to build up root reserves, the autumn spell to build up the plant for the winter and winter grazing and even cultivation to give an open sward. He has many followers and it is interesting to see dairy herds clean grazing 30 inch lucerne.

Crossing to France we find an interesting figure in Dr Mayer at Versailles. He has sorted out the tangle of French lucerne. A summary of his classification will be found in the appendix. Dr Mayer is working on an interesting programme quite against the beliefs of Tysdal and others workers of U.S.A. He is inbreeding different lines of lucerne to find strains which suffer little loss of vigour. From these he may compound hybrids along the lines of hybrid corn.

In the United States each State has some programme of lucerne breeding but Tysdal of Nebraska, Grandfield of Kansas and Graber of Wisconsin are particularly active. Larry Graber is a most colourful figure and is known locally as Mr Alfalfa. By his efforts Wisconsin, within his working life, has increased its lucerne area from 40,000 to 2,250,000 acres in spite of the most inhospitable environment and consequently all the pests and diseases possible. With Graber's example before us we need not fear if new diseases and troubles beset our lucerne.

In the middle west lucerne is fast displacing the traditional pastures of timothy and red clover. The companion grass used is smooth brome *(Bromus inermis)* chosen because it does not become too competitive, remains fine and leafy when mature and is drought-resistant. A seeding of 10 lb lucerne, one pound ladino clover and six pounds brome gives a pasture vastly superior to anything else seen in the area.

The next example comes from California, Luther Jones, whose interest is legume seed production. Much of the fundamental work required for its understanding was done by Tysdal, Grandfield, and workers in Utah, but California has put it into operation. Admittedly conditions are ideal, but when a farmer is given 1200 lb Nucleus seed with which he sows 1600 acres and from which he harvests nearly one million pounds of seed, one does not seek to belittle the achievement. The result is obtained by specialisation, by excellent technology, by first class soil, control of moisture by irrigation, hot sunny days and cool nights, by perfect harvesting weather, control of all pests and, most important, by cross-pollination by honey bees. Two to three hives are staggered per acre; if necessary the hives are changed and no alternative pollen sources are permitted to grow in the area.

The western states have become the small seed area for America. Except in such favoured areas as California, seed production is a vexed question the world over. Under gray skies the honey bee seems to be an ineffective pollinator except when searching for

pollen. Apparently lucerne is not a preferred plant as a source of pollen. We rely therefore on wild bees and the population is usually insufficient. Injurious insects can reduce seed set and may require to be controlled. One promising avenue of approach is by breeding. There are distinct differences in seeding ability of strains and such differences are inherited. Hardigan is a strain with exceptionally good seed set. Zaleski pointed out a distinct fault of Marlborough—the keel takes an excessive pressure to make it trip. A selection within the strain for easily tripped flowers may allow nectar gathering bees to trip the flower or encourage pollen gathering bees to visit lucerne.

We come now to the last development noted—the production of rhizomatous and creeping rooted strains. *M. falcata* has a characteristic of producing branched roots, and crosses with *M. sativa* show some of this character. Back crosses on to *M. falcata* may give even greater amounts of root proliferation than the *M. falcata* parent. Natural strains of rhizomatous lucernes are to be found. One is *M. glutinosa* under selection at Lincoln. Another is Nomad, or Burlingham creeping, found at Klamath Falls in Oregon. Both are small leaved, prostrate, short season types and by Zaleski's definition are inferior. However, Zaleski is testing lucerne for hay production on rich soil. Where the lucerne strain has to be fitted to the environment, as is the case with sheep pastures on the light stony plains, then Graber's approach is superior. Further, selection within the strain may give higher producing lines. Breeding work to achieve this same end was commenced by Dr Moe of Vancouver in 1928 and has resulted in the release of the variety Rhizoma. This is a cross between Don and Ontario variegated (or Grimm). It produces rhizomatous branches up to six inches long from a crown two or three inches under the surface. Moe isolated strains with much greater creep but found creep and productivity in inverse ratio. Rhizoma is a good summer producer, drought resistant and winter hardy. In Lincoln trials it is one of the better strains. When released in North America it was given a great deal of publicity but in Eastern United States is now somewhat derisively described as "weakly rhizomatous." Being wilt susceptible, it is perhaps adversely affected in North America. Moe's original cross was also used by Odland at Rhode Island and Heinrichs at Swift Current. Odland produced Narragansett by introducing a good deal of *M. sativa* blood and much of the creeping nature has been lost.

The most interesting new material in the lucerne world is undoubtedly Heinrichs' creeping rooted lucerne. While not yet bred to the status of a strain, releases of cuttings to various stations in the United States have created a tremendous wave of interest. This plant is not rhizomatous but has a creeping root from which stem branches arise. One three-year-old plant seen was nine feet across and had 286 separate crowns. Its root system is very like that of morning glory, the field convolvulus. The object in breeding this strain was to obtain a perennial legume for the range lands which would withstand heaving in the intense winter, would regenerate even if the parent root-stock died and would be more drought resistant. It was considered that a plant spreading by root branches would be superior even to one with rhizomes. Rhizomes depend on surface moisture for their spread whereas creeping roots can spread in arid soil.

The main parents of this strain are Ladak and Siberian. With this parentage and selected under the adverse climate of Saskatchewan, it obviously will not be a high producing plant. For New Zealand its use may be limited to a source of breeding material, but possibly the arid areas of Otago Central may one day blossom with its variegated flowers.

What, then, are the lessons from overseas for New Zealand? First, with 1000 miles of latitude, considerable variations in rainfall, variations in altitude, from sea level to 2000 ft., and utilisation, it seems obvious that one variety is inadequate. The sub-humid areas of Canterbury, Marlborough and Hawkes Bay are probably well catered for by a dominantly *M. sativa* strain such as Marlborough. However, in Canterbury at higher altitudes on less suitable soils a greater infusion of *M. falcata* blood may be superior. Grimm may be a preferred strain here as it may in Otago Central with its severe winter. Du Puits should be tested in humid districts where grass invasion may be held at bay by its early spring and late autumn growth. The English practice of sowing a non-competitive companion grass, such as timothy, for the same purpose should also be tested. At times of seed scarcity when importation is necessary the suitability of the strain for New Zealand requires more consideration. A good variegated strain may be superior to Hunter River or South African. Certified Provence is a suitable strain. Likewise Zaleski's suggestion of selecting a Marlborough strain with a flower less difficult to trip should be investigated and likewise the American approach of selecting high seed producing strains.

Finally, tests should be made of the possibilities of creeping lucernes for grazing pastures on light lands, a project in hand at Lincoln.

APPENDIX I

FRENCH LUCERNES

While extensively distributed, the lucernes, according to Mayer, fall into three main distinct types:

1. **Flamande types** found N.E. and S.W. of Paris, e.g., Ile de France, Beauce, Ormelong, Du Puits, Chartainvilliers. An erect type, tall, thick half hollowed stem, leaves 33 per cent. of total production in first cut; first cut 10 to 15 days earlier than other French types; nine per cent. variegated flowers, poor summer growth under drought, good autumn growth, resistant to winter frost, short-lived stand tends to weaken after two or three years, high proportion of fasciculated roots. (Du Puits not so high) quick recovery after cutting—gives four instead of three cuts, hence higher yielding. Does not stand trampling or grazing and easily killed by it.

2. **Provence types.** Rhone Valley to Mediterranean. Semi-erect, shorter, fine solid stems, leaves 43 per cent. of total production in first cut; first cut 12 to 15 days later than Flamande, only one per cent. variegated flowers, good drought resistance, poor autumn growth, killed by winter frost, few fasciculated roots, has strongest tap roots, slow recovery after cutting except under irrigation, stands trampling better (however, no French lucerne is grazed until it is run out), very persistent.

3. **Poitou types** from Atlantic seaboard, e.g, Vendee, Marais. A variegated lucerne similar to Grimm. But unlike the lucernes of Franconie from which Grimm came, this Atlantic coast has never had the effect of natural selection for winter cold. Poitou has 30 per cent. variegated flowers, 40 to 60 per cent. of the plants have fasciculated roots. It is semi-erect, has fine, solid stems, is very leafy (45 per cent.) and is late, as is Provence, in first cut and in flowering. Is subject to winter killing but less so than Provence. Persistent and in the third season is equal in yield to Flamande.

Certified strains are now available from France and the difficulties experienced a few years ago should not occur again.

2. LUCERNE-GRASS-CLOVER MIXTURES

Associate Professor J. W. Calder, Lincoln College.

In this paper I shall confine my discussion to pasture mixtures for what is commonly known as light plains land; it is based on the findings of experimental work on the Ashley Dene farm.

Since the spasmodic introduction of subterranean clover from Australia in the early 1930's, followed by the enthusiastic advocacy of Professor Hudson in 1937 the productiveness of light plains land has improved considerably. This was because a new legume had been found which was able to grow well under the peculiar soil and climatic conditions and so provide an increase in pasture growth over and above that produced by the previously used pasture plants, chiefly the ryegrasses, cocksfoot and red and white clovers.

Subterranean Clover

The particular soil and climatic conditions are such that moisture is often a limiting factor for growth during dry months from October to April inclusive when temperatures are favourable, while moisture conditions are generally favourable from April to October, when temperature conditions are low. The older legumes used—red and white clover—are unable to thrive under low temperatures. But subterranean clover is a winter annual. It germinates naturally in the autumn (with sufficient moisture), grows through the winter (but slowly under low temperatures) and when supplied with adequate lime and phosphate is ready to take full advantage of rising spring temperatures to give a spring flush during October and November. This form of production suits fat lamb farming and if growth would only continue through the summer it would be ideal. But dry weather often sets in early and the subterranean clover may dry off before it has done its job. I suppose it would be too much to expect one plant to satisfy all requirements under these rather critical soil and climatic conditions, consequently we sow a mixture and now we want to think of a plant which will withstand drought conditions in the summer.

Subterranean Clover and Grass Mixture

Subterranean clover was and is frequently sown in a mixture with the standard sowing of ryegrass or cocksfoot used on better soils with better moisture conditions. The mixture on these light plains land is often drilled. Often an excellent growth of both clover and grass is obtained in the first year and where moisture conditions are favourable a very satisfactory pasture can be obtained; but in the second and subsequent seasons, should a dry autumn ensue, a rather surprising thing may happen. The subterranean clover may not germinate and for the next season we have a well covered pasture with ryegrass or cocksfoot in seven-inch rows but with very little clover. Now without clover—which must be vigorous and which must be grazed to circulate the nutrients, particularly the nitrogen—grass will not grow vigorously and production falls. The explanation of this behaviour is one of competition for moisture between the already established grasses and the subterranean clover seed endeavouring to germinate. The competition is most severe in a dry autumn. There just is not enough moisture for both plants and the already established grasses, with roots penetrating every particle of soil, take what little there is. In the absence of vigorous clover the pasture develops a "grass bound" condition with low production. This condition can be overcome. All that is necessary, is to thin out the established grass which is hindering the germination of the clover. This can be achieved by top-working the pasture in January. The top-working is designed to have two effects: first, to reduce the density of the

grass and, second, to provide a moist seed bed for germinating subterranean clover seed. The top-working can be done with any of the top-working implements after subterranean clover seeds have matured and in time to secure an early autumn establishment. Farmers were doing this in 1950. In Table I the effects of this treatment can be seen in the increased production of Treatment D, which was top-worked in February, 1951, and gave increased production in 1952 season. A further increase could be achieved by over-sowing some oats or H1 ryegrass on the top-worked land. This is now an established practice on Ashley Dene farm under Professor Flay's supervision.

Lucerne

A deep rooted perennial productive legume. What could be more desirable to meet the needs of summer grazing on this light plains land? For many years lucerne has been grown as a hay crop and it was a natural process that when ewes and lambs were short of grazing in January and a green aftermath of a hay crop was over the fence, then in they went. So lucerne has been used increasingly. And it has done a splendid job. The farmers, whose papers follow, will convince you by their experience of its value.

Lucerne and Grass Mixture

The use of mixtures of grasses with lucerne has been developed by a few pioneer farmers in this field and Mr E. G. Smith of the Department of Agriculture has produced some good experimental evidence of the value of thin sowings of grass with lucerne and of sowing cocksfoot and lucerne in alternate rows. This is a very interesting development and results of Mr Smith's work and farmers' experience of these mixtures will be a big help in understanding the problems of these light plains pastures.

Lucerne-Subterranean Clover-Grass Mixtures

According to reasoning from the experience with subterranean clover and lucerne with a thin seeding or stand of grass we should now have the ideal mixture for these light plains land grazing pastures. A mixture of this type was sown on the trial area at Ashley Dene in September, 1949. The mixture consisted of

Marlborough lucerne ..... 10 lb
Phalaris ..... 7 lb
Subterranean clover .... volunteer

The production figures from this mixture have been high throughout and as you would expect, have been particularly good in the February-March-April period.

TABLE I

Production of Dry Matter in Pounds Per Acre

	1950	1951	1952	1953	1954	Aver.
B. Thin stand of ryegrass + subterranean clover	4316	3077	5673	4353	801	3644
C. Lucerne-phalaris + subterranean clover	4708	4109	5522	6181	2811	4666
D. 1 bushel of ryegrass drilled + subterranean clover	2082	2712*	5593	4473*	1850*	3340

*Top-worked at the end of the growing season.

The phalaris was included in mixture C because it was considered it would offer less competition to the subterranean clover than would ryegrass or cocksfoot—at least the normal sowings of these. It has done quite well up to the present but the stand has become invaded with goose grass and hairgrass and the subterreanean clover has weakened from this competition. It is interesting to record here that by sowing the mixture in the spring the lucerne and the subterranean clover seedlings grew equally well together whereas some autumn sowings of lucerne have suffered because of the more vigorous growth of subterranean clover compared with lucerne in the cooler months. Once established, lucerne plants do not appear to suffer from autumn growing subterranean clover.

Creeping Lucerne, Subterranean Clover and Phalaris

In February, 1948, a 24-acre field at Ashley Dene was sown in a mixture of

Creeping lucerne	4 lb
Phalaris	5 lb
Subterranean clover	4 lb

Both 1948 and 1949 seasons were dry and the mixture established slowly but satisfactorily. The mixture was grazed as an ordinary farm field. The 1950 season was very wet and with adequate feed on the farm, the field was closed for lucerne seed which, however, was not taken and the crop was grazed off during the winter. In 1952, it was grazed throughout and in 1953 and 1954 it was grazed in the early spring with lambing ewes and later closed for hay, a crop of about one to one and a half tons being taken in both seasons. Thereafter it was grazed in the autumn and winter as required. In 1955 after spring grazing it was saved for seed and a light crop taken.

At the beginning of this season, to meet requests for production figures from this very valuable grazing stand, Dr Coop fenced off a seven-acre block at the same time as he fenced off three blocks of standard pastures on other fields. From 29th September the four areas were set stocked with approximately four and a half ewes and their lambs per acre for varying periods. He has given me the grazing returns from the four fields, as follows:

TABLE II

	Days Grazing	Growth rate of lambs per day	Estimated Total Lamb Weight
1st year new pasture drilled with oats after being used for greenfeed	20	.610 lb	61 lb
2nd year pasture drilled ..	22	.517 lb	56½ lb
14-year subterranean clover ..	41	.514 lb	105 lb
7-year creeping lucerne, phalaris and subterranean clover	50	.587 lb	147 lb

In addition to the grazing return we have secured dry matter production figures from three of these fields.

TABLE III

Showing Seasonal Dry Matter Production in Pounds Per Acre 1955

	1st year new pasture drilled with oats	2nd year pasture drilled	7-year creeping lucerne, phalaris and subterranean clover
Winter (May, June, July) ..	810	39	123
Early spring (August, September)	1404	131	996
Spring flush (October, November)	367	109	946
Summer (December, January) ..	292	213	669
Autumn (February, March, April)	289	335	755

There was a vigorous growth of subterranean clover in the new pasture until it dried off in October. There was practically no subterranean clover in the second year pasture and only a fair proportion in the creeping lucerne mixture where the dry autumn and competition for moisture with weed grasses has checked subterranean clover growth in this mixture for the past two years.

The evidence presented shows that the mixture of creeping lucerne with subterranean clover and an open grass sward has performed extraordinarily well after seven years of farm grazing and haying. Today the lucerne is as good as, if not better than ever it was.

Mr Iversen has told you of the wave of interest in creeping lucerne in Australia, Canada and the United States. Ashley Dene experience with one of the creeping types has shown that there is distinct promise in its use as a component of a grazing mixture on light plains land. The College was fortunate to secure a fair yield of seed from the 1954 harvest which has been distributed widely for farmers to gain experience of its behaviour and to compare it with the already popular Marlborough type under their own conditions. It may be that it will prove to be the ideal supplementary plant to include in a mixture with subterranean clover and a thin seeding of grass.

At Ashley Dene trials are under way to test other lucerne varieties and seed mixtures. The lucerne is also under trial on other soil types. At the present state of our knowledge I should recommend a mixture such as the following for these light dry plains lands:

Creeping lucerne	3 lb
Subterranean clover	4lb
H-1 ryegrass	2-4 lb
Perennial ryegrass	2lb
Cocksfoot	1 lb
White clover	1 lb

To this might be added phalaris, 4-5 lb, Marlborough lucerne 3-5 lb, dogstail 1lb. One or other of the creeping lucerne types mentioned by Mr Iversen may turn out to be superior to the one we have, but in the meantime we have got something which is good as it stands.

3. LUCERNE IN THE FARM PROGRAMME

(a)

Mr B. J. Kennington, Grassmere, Seddon.

My farm comprises 625 acres and carries 900 Corriedale sheep and about 50 head of cattle. It is situated seven miles south of Seddon in the 23-inch rainfall area. It is tussock hill country with

about 30 acres of flat land suitable for lucerne growing. At one time the farm had approximately 80 acres in lucerne which meant that a good deal of it was growing on hilly country. This was not satisfactory for it was discovered that lucerne could not hold the top-soil. In fact Marlborough has a smaller acreage under lucerne than it had in the early days when enthusiastic farmers sowed lucerne wherever they could plough. Today lucerne is almost wholly confined to the flat or easy down land.

It is my practice to sow 14 lb of Pedigree Marlborough in September or October. This seems rather a heavy seeding but as good hay is my main consideration I find that about right. A thick stand of lucerne gives a finer strawed hay and consequently less waste when fed to sheep. It gets a ton of lime per acre every three years and one hundredweight super each spring. When I plough up an old lucerne stand I grass the paddock down for a few years before resowing in lucerne.

Usually two cuts of hay are taken and then early in December suitable paddocks go for a crop of seed. I side rake the hay as soon as it is cut and turn it occasionally until it is cured. Using a pick-up baler I bale in the evenings so as to save as much leaf as possible. As soon as it is baled it is carted into the shed. The aim is to make good hay and keep it dry as I consider that one bale of bright hay is worth a dozen that have been heaped up without any covering.

The hay feeding programme varies according to the severity of the winter. The ewes get hay in June and July and the hoggets are fed hay for about three months. I buy young cattle in the autumn and they get some hay in the winter. Any surplus hay is fed to the fattening cattle to enable me to get them off earlier in the spring.

One spring I made molasses ensilage in a pit as the lucerne was too weedy to make good hay. The following autumn was very dry and I started feeding it to the hoggets in March. They took to it readily and did very well on it. The only reason why I have not made it again is because of the extra work involved.

Lucerne makes the best grazing when it is near the flowering stage. At this stage it is excellent for weaning lambs on to and I have fattened lambs quickly on lucerne. Winter grazing is not practised on the good stands. We used to have losses with bloat when grazing sheep on lucerne. I have found that feeding a lick with plenty of salt in it has cut my losses to a minimum. I use a proprietary lick with molasses in it and mix in twice its weight of coarse salt. The only times that I have had sheep blown on lucerne in recent years have been those when the lick boxes have been empty. I do not know why salt is a preventative but I do know that it works.

There is a good healthy stand of lucerne nearby that has been down for 37 years and seed crops have been taken from it in recent years. The average useful life would be about 15 years. The worst weed we have to contend with is barley grass and grazing with sheep encourages the spread of it. I have given up trying to control it by cultivation, which only seems to make a seed bed for another crop of it.

I have been asked to make special mention of my experiences in seed production but I have come to the conclusion that there is a lot of chance attached to it. I could tell the history of lucerne seed production here but it is the future that gives us most concern. Although this district still grows good lucerne we are not able to get the big yields of seed that we did some 30 odd years ago. Then. yields of 800 lb per acre were common, but now 200 lb is thought quite good. There is still the odd crop that will yield about 400 lb.

The soil types that grow the best crops of seed here are the heavy loams over stiff clay subsoil and also the deep clay silts.

The reason for the general decline in yield has been the subject of some investigation. Contrary to American opinion I have not found that bees have any effect on seed setting. We usually get plenty of wind to spread the pollen. It has been noticed that paddocks that have been grazed by sheep prior to being closed for seed have yielded better crops than those paddocks from which several cuts of hay have been taken. An increase in insect pests has been noticed.

The worst insect pest is the "Timlins" bug. This is similar to the *Lygus* bug in America. The green ones are in the nymphal stage. The adult is often lighter and more brightly coloured earlier in the season. The adults are strong fliers and rapidly spread through an area. If disturbed they will drop to the ground where they are particularly difficult to see.

At all stages they suck plant sap; starting with the buds, which then fail to develop, then on to the flowers as the buds become scarce and eventually they will pierce the pod to suck the seeds. The flowers usually drop off although occasionally an odd pod sets without seed. The affected seeds shrivel and go brown and the pod ripens more rapidly than usual. I am convinced that at least 80 per cent. of shrivelled light seed at harvest is the result of the activities of sucking insects.

Control methods are difficult and I feel the best approach will be through biological control. I have had 100 per cent. kills with Lindane and H.E.T.P. and good results with D.D.T. and D.D.D. I suspect the insect is susceptible to most insecticides but the drawback is of course the effect on bees and other useful insects. H.E.T.P. sprayed in the evening when the bees had finished working gave good control but it still killed useful insects which prey upon the bugs. I am sure that the sparrow eats the bug and in an area where I scattered wheat seconds to attract the birds the bugs soon disappeared.

The features that I like most about lucerne are: its ability to stand drought, the good hay and feeding that it gives, and the length of time it remains productive without re-sowing. Lucerne is a most valuable crop on my farm and I only wish I could grow more of it.

(b)

Mr J. M. Walsh, Fairhall, Blenheim.

My farm is situated in the Fairhall district. The land is flat and the soil is classed as Omaka alluvial gravel. Most of it is light to medium and easy working but there are stony patches. The subsoil is gravelly and in dry seasons crops tend to dry out. Our average rainfall is about 26 inches although we have had over 30 inches on occasions. We get fairly strong nor-westers, but not nearly so strong as those in Canterbury. I have farmed the property over the past ten years as a mixed cropping, small seeds and sheep farm.

Lucerne does well under a wide variety of conditions and is a forage crop of outstanding merit—in fact I cannot understand why more of it is not grown in New Zealand—but it is not so easy to secure a good seed crop. My experience has been that a good medium, well drained soil with an easily penetrated subsoil is the most suitable for seed production. If a heavier silty soil ideal for hay production is selected the crop will keep growing into the autumn and will not seed. If the paddock is too light the crop will wilt off when the dry February weather sets in.

There is a wide variation in strains of lucerne seed, but Marlborough lucerne has a reputation of doing very well anywhere in New Zealand. I naturally started with Marlborough seed, but now have all Government stock. The Crop Research Division made this selection from the Marlborough strain. It is much leafier and comes away earlier in the spring. In the autumn I would say the growth is the same, and their seeding capabilities are about equal.

When establishing a stand I prefer it to follow a crop of wheat especially if I intend to take seed. I feel sure that if farmers put more work into the sowing down of their fields and made sure of a good strike the acreage in Marlborough and Canterbury would be doubled. Years ago many complete or partial failures were due to the seed being sown without inoculation. The reason for inoculating is to supply certain micro-organisms which encourage the formation of root nodules necessary for the fixation of nitrogen which is essential for the strong and healthy growth of the plant. As there is no known method of determining whether the organisms are present, the inoculation of the seed is a wise insurance against a poor strike. After the seed is inoculated care must be taken not to mix it with straight superphosphate or other soluble fertilisers as the inoculant will be destroyed. I usually mix half super, half lime and leave it on the barn floor for at least two days, then mix the seed in thoroughly and sow immediately.

I am very strongly in favour of sowing lucerne in the late spring. I consider one gets better weed control. I prefer to sow the lucerne on its own as a special crop, although I have seen excellent stands established with cover crops of barley. A good clean healthy stand of lucerne can be expected to last for several years, so I feel it warrants establishment on its own.

To prepare the seed bed I skim plough in the autumn. This is followed by thorough cultivation in the dry weather to kill twitch. After rolling, the weed seeds germinate and I then plough fairly deeply and leave it to the winter frosts. As soon as the paddock is dry enough in the spring one ton of lime is applied per acre. Later cultivation is usually not very deep so as to avoid bringing up fresh weed seeds. The aim is a really fine firm seed bed. Drilling ensures a uniform depth of sowing and as a precaution against sowing too deeply the coulters are pulled right back. I usually sow 12 to 14 lb of Government stock inoculated seed mixed with one hundredweight of the fertiliser mixture already quoted per acre. I do not harrow after the drilling. If heavy rain follows sowing, fathen and other weeds make an appearance and I harrow the stand with a special set of light pea harrows. This harrowing does not affect the young lucerne plants in the drills, rather it has the effect of moulding them up, and then with a final rolling the stand should be established.

After the stand is about two inches high, one hundredweight of superphosphate is applied. When the young plants are five to six inches high, I always top the stand. This topping cleans up all weeds, and as the lucerne grows fast, no further trouble from the weeds should be experienced.

Years ago Marlborough lucerne had a great reputation for its quality and quantity of seed, but of recent years the saving of lucerne for seed has been a risky business. A lot of investigation has gone into the causes of seeding failures. Some stands do not make any attempt to seed while in other cases the half-formed pods fall off. Some of the stands are attacked by insects. I sometimes wonder if the trend to sheep farming, with increased topdressing and liming, has built up a fertility in the soil unsuitable for lucerne seed production.

The *Heliothis* caterpillar, which is also found on tomatoes, can do a lot of harm and is especially prevalent in crops taken after the paddock has been cultivated. It just strips the pods right off. Spraying with D.D.T. kills it, but bees visiting the lucerne flowers are also killed. Sparrows are very fond of the caterpillars but they cannot clean up a paddock quickly enough. Another type of insect, smaller than the *Heliothis*, and greenish in colour, also strips the pods. In order to combat this menace some farmers are using D.D.T. superphosphate when topdressing and others have tried hard spring grazing to clean up old growth which might be harbouring the pests.

A lot of farmers decided that the lucerne flowers were not being tripped. Many and varied methods have been tried to bring this about from dragging empty petrol tins over the stand to driving a mob of hoggets through the paddock. Nothing very conclusive arose from these trials. I do not think we know when the flowers are ready to trip anyway. Some thought a shortage of honey bees was the trouble. Several attempts were made to test this but the results were not conclusive. One seed paddock was dusted with powder. Later, bees were caught and they were found to be covered with this powder which shows that they had been working the area. Cages were erected over certain patches to exclude the bees. No comparisons could be made as no seed set despite the fact that nearby, on a similar soil type, fair yields were obtained. I have read that honey bees are considered essential for fertilising seed in America. Yet on one farm near me where two hives per acre were placed in a crop, absolutely no seed was obtained although down the road another farm without bees reaped a reasonable crop. It really looks as if there is need of far more investigation into just how the flowers are tripped and what part honey bees and bumble bees can play.

In order to see if the failure was caused by some mineral deficiency in the soil, I had soil tests made from two paddocks. They seemed right as far as essential plant foods were concerned, but I started a series of manurial experiments. The following fertilisers were used against a control: a mineral mixture, molybdenum super, superphosphate, half potash plus half superphosphate and two ton per acre of lime against one ton. The first year of the experiment there was no seed at all, but there was a lighter cut of hay on the control strip. In the second year the whole paddock seeded well, and there was no difference as regards the quantity or quality of the seed over any of the manurial plots. The really important part to note about this experiment was that the weather conditions were entirely different. In the first year the weather was cool and cloudy when the lucerne was flowering and very few honey bees were about. In the next year when the seed set well we had a fortnight of really bright sunny weather with just enough nor-west wind to gently wave the flowers to and fro. There were plenty of honey bees about and a few bumble bees. The flowers were a particularly deep blue. There was no second growth at all in the crop and the seed growth was short and stemmy.

I have experimented a fair bit to see whether the time of flowering has any bearing on seed production. I have found that by shutting up the paddock after the first hay crop we get a tremendous bulk of straw and no seed, although I have seen an excellent crop produced this way on a neighbouring farm. I make the practice of taking two cuts before shutting up, the second cut being off the paddock by Christmas. Well made lucerne hay is particularly nutritious. The first cut is usually fairly difficult to make into good hay because of unfavourable weather conditions and it may be wisest to make this into silage.

Very little direct heading is done in our district. I always cut and then pick up from the swathe. The time to cut is always a problem but I wait until approximately two-thirds of the pods are black, relying on the substance in the straw to ripen the rest. At this time of year it is likely to rain so I pull the swathe together reasonably well to prevent the young lucerne growing through the swathe. Later, if necessary, I undercut with the lifters on as if the pods are left in wet undergrowth the seed will very soon sprout. The minute the crop is ready it pays to be in with the header. During the past two seasons weather conditions have been suitable for the setting of the seed. Last year I harvested just over a bag to the acre of Pedigree seed and this year two-thirds of a bag per acre.

To secure a long life of maximum production, grazing should be carefully controlled. The consolidation caused by grazing favours the establishment of grasses. A light grazing after the seed crop helps to scatter any heaps of straw left by the header, and is an ideal change for hoggets. In mid-winter when the frosts are heavy I do not graze at all. In the early spring I graze lightly with a few early lambing ewes, as this grazing is very valuable until the grass paddocks come away.

After a paddock has been down in lucerne a few years, and particularly if it has been over-grazed, barley grass, rib grass and other weeds make their appearance. In the less well drained areas, a light coating of moss appears. At this stage I think a good cultivation is necessary using the special lucerne points, and going both ways through the paddock. This is followed with a harrowing and rolling to make sure the paddock is level for future hay making and harvesting operations. The ideal time to do this cultivation is in the very early spring just before the growth starts. Put your top-dressing on and then cultivate, although whatever the time of cultivation you are apt to kill one weed and start another.

Lucerne is a crop which, when certain requirements of management are met, provides a large quantity of good quality feed. Seed production is beset with problems but most can and will be overcome, however, adverse climatic conditions at flowering can have a depressing effect on yield.

(c)

Mr E. C. Topp, Waipara.

I was very pleased indeed to receive an invitation from the Committee to assist in what should be an extremely valuable discussion on this very useful and truly wonderful plant—lucerne. Bearing in mind the fact that the primary purpose of this conference is to increase production, I feel that those of us who have been asked to contribute papers relating to our experiences in growing and using lucerne have a great responsibility on our hands today. We must not allow this opportunity to pass of proving conclusively to you all that there is a tremendous potential for increased production in a much wider and more general use of lucerne as a pasture plant. I sincerely hope that we can convince you all of this to the extent that those of you who have suitable land will return to your farms with a firm resolution to institute a programme of lucerne establishment straight away. I know of no other single factor (excepting irrigation, perhaps) that could give us so much extra production with so little cost and effort.

I feel somewhat sorry that a talk about lucerne was not placed on the agenda of this conference a few years ago. I am sure that it would have been most profitable even then. I well remember four

years ago, after reading a paper on "Fertility in Ewes" how the subsequent discussion continually drifted towards lucerne. There was certainly great interest shown then in the practice of growing lucerne for pasture. Time is a great testing medium and so today our experience is the riper and our opinions and conclusions more confirmed.

Now you will already have realised that I am an enthusiastic advocate for lucerne as pasture. My fifteen years' experience of its use in this way has been successful beyond all expectations but I assure you that I shall not allow my enthusiasm to lead me to make extravagant claims for its capabilities. Let us discuss its weaknesses and limitations along with its better and desirable characteristics. We must endeavour today to spread as far as possible the truth about lucerne.

Perhaps I can make my contribution better if I just give a hurried picture of our farm as regards locality, area, type of soil, constituents of present pastures and carrying capacity and then tell you my considered conclusions regarding the characteristics of the plant and its management. From my experience of these conferences I know that question time will fossick out much of the desired detail so I will endeavour to make my points as quickly as possible.

Many of you, of course, will know the location of our farm. It lies just past the Waipara Bridge, between the road that branches left at the bridge towards Waikari, and the Waipara River. It comprises 1125 acres with 125 acres of river frontage. The whole farm is flat except for the terraces that lead down to the river-bed level. The land is generally light and stony, the thin soil overlying a great depth of yellowish shingle subsoil. At the present time there are approximately 650 acres sown in lucerne, 50 acres of rape and the balance grass, carrying 2250 ewes, 800 hoggets, 60 rams and 25 head of cattle. I could say here (to the credit of the lucerne) that our stock are invariably in high condition. I should like to point out also that, owing to the extremely early and severe drought that beset Canterbury this spring, with the consequent dismal prospects for summer and autumn feed, rather more ewe hoggets and ewe lambs were sold than would otherwise have been the case; consequently the sheep numbers are down 200 on those of last year instead of following the usual trend of an annual increase. Furthermore, 17,000 bales of hay were made and 25 sacks of lucerne seed headed.

I submit that that is a very satisfactory state of production (thanks to lucerne again) from a farm that would barely carry one sheep to the acre in fair condition when we went on to it 26 years ago. Of course, production could have been considerably increased by various other methods, but having regard to the small amount of cultivation required in the present practice, I am absolutely convinced that no other way would enable us to carry so many sheep so easily and cheaply. And this is the way it is working out in practice: the more lucerne we sow the more sheep we can carry and it does seem probable that in due course with more and more acres coming under lucerne, the sheep numbers may reach the 4000 mark. Anyway, that is our ultimate goal. Whether we reach it or not remains to be seen. I think we shall.

Now, the plant itself. From the foregoing it should be quite apparent to those of you who do not know the locality, or who have not seen the farm, that lucerne is doing its work extremely well, and so, if you have conditions similar as regards land and climate, you should have success in growing it also.

The first essential for the establishment of lucerne is an open, well drained subsoil. If you have not that, if your land is swampy,

if there is under-current near the surface even for a short time during the year, if your subsoil is stiff clay or pug, you can count yourself out. I would not hold that as a weakness in lucerne; rather would say it is a limitation, for there are numerous other desirable pasture plants that flourish in those conditions. I would go further and say therein lies its great strength insofar as it thrives on that land deemed light and difficult because of the open free subsoil on which no other plants can match lucerne for production. And here there may be some misconception concerning the rooting habits of lucerne. Much prominence has been given to its ability to root deeply and indeed lucerne roots are often found penetrating to surprising depths. But that is only on favourable subsoils where there is promise of a drink of wholesome water and some food. On the uninviting stony dry subsoils underlying most of our light land it does not waste its energy rooting deep down where there is neither food nor water. The average length of a lucerne root on our farm would be from 18 inches to two feet, but it is a very stout tap root, about the thickness of a man's finger, and surrounded by innumerable hair-like little roots. This tap root is really a storehouse for plant food and enables the plant to live on happily during difficult periods. It is this characteristic rather than its deep rooting ability that makes it so adaptable to our light lands. Yes, I believe this plant was specially designed by God for our lighter land so that it might produce abundantly and contribute its full share to the sustenance of His children.

Now we will touch on its unfortunate weakness—that is, its inability to survive in competition with other plants. The heavier the land (providing it has that essential open subsoil), the greater the production lucerne will give in its first few seasons, but simultaneously the intruding weeds and grasses will flourish and gradually become thicker and thicker. If the stand is continually cut for hay or silage its inevitable death may be delayed for several seasons, but if the stand is grazed to any extent, the selective picking of the lucerne by the stock will aid the smothering effect of the intruding plants and in a more or less short time the lucerne will die out. So we will work away from the heavier land to lighter and lighter land until we come to that class of land where intruding plants, which are principally annuals, weaken and often succumb to lengthy seasonal spells of heat and dry winds leaving the lucerne clean and free from molestation. When the rains do eventually come, it is almost incredible to see the quick revival and abundant growth of lucerne. Our farm is mostly made up of this type of land but it varies considerably and there are some parts which are much better than others, and there are some which are very poor. On the better parts, intrusion is quite obviously shortening the life of the lucerne but on the poorer portions the lucerne seems to remain the same from year to year. Of course poor land cannot produce to the same extent as better land, but I firmly believe that the poorer the land the greater will be the relative increase in production if sown in lucerne. From our experience the only thing that will kill lucerne is smother. The scientists are working on this problem from the spray approach and it would indeed be a wonderful boon if they can eventually find a preparation to kill the intruding plants and leave the lucerne unharmed.

I mentioned earlier the ability of lucerne to revive quickly after a prolonged drought; this is, I believe, its most wonderful characteristic. From my observations it seems that when the effort to grow becomes too difficult, it quietly goes to sleep and lies dormant without any weakening effect whatever, and that, of course, makes it peculiarly suitable for light areas subject to drought. Indeed, judging by the suddenness and virility of growth when rains do come

after a prolonged drought, I wonder if it does not even gain strength during the time of its dormancy. Its behaviour seems something akin to the hibernating instinct of the hedgehog.

And now a word about the grazing of lucerne. It was a generally accepted belief until these last few years that it was certain death to lucerne to allow stock to graze it, and it does seem, from a car's-eye view after travelling through Canterbury and Otago that that idea still persists to a very great extent. There are many very flourishing stands of lucerne to be seen in widely distributed areas throughout Canterbury and Otago but it is obvious that invariably it is being grown for hay. There is always the stack of baled hay in the corner and no stock to be seen actually grazing on these beautiful, green paddocks. About a year ago there appeared in the press a story of a farm at Gimmerburn where lucerne was being grown for grazing purposes with extremely gratifying results, and the country about Gimmerburn did not look very inviting to me. Anyway, a visit to our farm (and I can assure you of a hearty welcome at any time) would prove conclusively to you that lucerne on light land can be grazed without any ill-effects. On the poorest part of our farm (and I can assure you it is extremely light and stony) we have several paddocks that have been sown for ten years, which have never been cut for hay and which are almost as good now as they ever were, even in their first few seasons. In a favourable spring it would be possible to take two cuts of one ton each off this shingly area. The grazing management must of course follow somewhat a rotational plan, not necessarily a rigid one. Lucerne does not lend itself to the system of set-stocking for that tends to assist its deadly enemy, intrusion. Subdivision is also a great help to management as smaller areas can be cleaned up more thoroughly and lucerne does like to be clean.

And how do our sheep do on lucerne? That is a question I am often asked. I can answer that best by giving you some production figures for last season. No doubt the extremely dry conditions experienced during the spring had a beneficial influence on the health and thriftiness of all stock, but the fact remains that from mid-September until the time of drafting in early November most of our sheep were feeding on pure lucerne (the intruding weeds and grasses had succumbed to the extreme heat and dryness). It was the first time I had experienced such conditions in the spring; in fact I had always regarded a hundred per cent. pure lucerne pasture as an impossibility. There seems always to be a certain degree of intrusion in a normal spring. Now for some figures: 2330 Corridale ewes were put to Corriedale rams. The first lot of about 700 were timed to start lambing on July 20th, the second lot of about 1100, ten days later and the remainder—all two tooths—ten days later again. By August 1st we had 300 lambs; by the end of August there were approximately 2000 and the remainder of 830 tapered off to the middle of October. The twin lambs were segregated from the singles and the singles were split into two mobs and the area they grazed on was all lucerne. On the 5th November 445 of the tops were taken out of both single mobs and killed just under 32 lb. On the 11th November 600 more were taken out of the single mobs together, with 54 wether lambs from the twin mob, and killed a shade better than 30 lb. On the 23rd November 500 wether lambs were sold in Addington as stores at a satisfactory price. The following week all lambs were weaned and the remaining wether lambs and the cull ewe lambs, to the number of 500, were sold in Addington at very satisfactory prices. Of course the next week the drought broke and we were rather sorry we had sold so many ewe lambs. The ewes were shorn straight after weaning and clipped a shade over 12 lb. I tell you all

this to prove one point, a very important point indeed: lucerne is a complete food. And so, to return to that question—"How do your sheep do on so much lucerne?" I say, "They do so well that we will not be satisfied until all our property is sown in lucerne." So our present programme is to sow about 50 acres of new lucerne each year. I mentioned earlier that we have 50 acres in rape this year. The primary reason is not so much to have rape for fattening (for lambs will fatten reasonably well and more cheaply on lucerne) as to prepare the paddock the better for sowing the lucerne.

Now there is a great deal more I could write about this wonderful lucerne—"the king of fodders," as that discerning old gentleman, Mr Gardner, remarked as an afterthought to his interesting and racy description of his recent tour of Australia, but I do not wish to take up too much time. Question time will be much more interesting and informative.

Perhaps I will make this observation: I am really puzzled to know why lucerne has not "taken on" more than it has. As I said earlier, there are stands of lucerne flourishing for everyone to see in many widely distributed parts of the South Island. Why has the adjoining farm no lucerne stand, and why has not the farm with one stand got two stands, or three or four? I do hope that I get the answer today. I know there are tens of thousands of acres in the South Island on which carrying capacity could be doubled and perhaps trebled by the more extensive use of lucerne as a pasture. I am sure that on light land there is only one thing better than lucerne and that is better lucerne. Now what a wonderful future would be ushered in for Canterbury if we could but bring to pass these two things: full scale irrigation, and all light land sown in lucerne.

(d)

Associate Professor A. H. Flay, Lincoln College.

The College's Ashley Dene light land farm of 878 acres is well known to most of you. Its history of development from 860 breeding ewes to 1500 breeding ewes plus replacements, i.e., to 2000 ewe equivalents, has been well publicised. The factors responsible are now well known; they have been the use of subterranean clover in all pasture mixtures and the topdressing of same; lucerne for hay and silage as winter feed, and the replacement of the six-horse team with tractors. Liming of one to two tons per acre over the past twelve or fifteen years has also been an important factor. It should be mentioned that the topdressing of "sub." pastures has amounted to only one hundredweight in alternate years—a very light topdressing programme. Topdressing on lucerne was one and a half to two hundredweight of super annually plus one ton lime in alternate years. Today the lime status of the farm ranges from 5.7 to 6.8 pH and so from now on only maintenance treatments would seem necessary. The phosphate status of the soil is still low and it seems that at today's price one hundredweight super annually for subterranean clover pastures would be the more profitable application and for the past two years this policy has been in operation.

The most important development at Ashley Dene in recent years is the extension of the lucerne area. The first lucerne was sown at Ashley Dene on an area of 12 acres in 1937-38. This was solely for hay production. Other areas soon followed but for hay and silage purposes for winter feed. Then there was the advent of creeping lucerne and eight acres were sown in 1946. By 1950 there

were 44 acres growing creeping lucerne as pure stands or with other pasture species. Also, by 1950 there were 71 acres of Marlborough lucerne, giving a total of 115 acres. Hay and silage continued to be the main product of this area, but grazing was taking place on some areas at lambing time and the late summer growth was being grazed off. A paddock of 24 acres of the grazing lucerne with phalaris sown in 1948 was intended as a grazing field and it has been used mainly for this purpose ever since. Since 1950 a further area of 34 acres of pedigree lucerne has been sown primarily for hay, and two areas, one Pedigree Marlborough and one creeping lucerne, totalling 71 acres, primarily for grazing. This area of 71 acres is a mixture of lucerne and phalaris or cocksfoot. Subterranean clover comes in automatically now. And so at the present time this farm has 220 acres in lucerne or lucerne-pasture mixture—one quarter of the farm.

TABLE

Lucerne Areas and Ewe Equivalent—Period 1937-55

Season	Lucerne Sown	Total Area in Lucerne	Ewe Equivalent
1937-38	12	12	860
1946-47	32	85	1900
1950-51	30	115	1800
1954-55	31	220	2000
1960-61	30 (?)	350 (?)	2500 (?)

With the present 2000 ewe equivalent carrying capacity the average hay (or silage) consumption as winter feed is the average production for 80 acres on the medium-light soils of this farm (64 acres in paddocks 8 and 9 this season—1954-55—gave in three cuts a total of 5700 round bales, or approximately 120 tons of hay). This leaves 140 acres for grazing. In reality, of course, grazing and hay are taken irregularly from all areas as required.

Before proceeding further perhaps we should remind ourselves of the grazing uses of lucerne. Commencing with the beginning of the season, lucerne provides valuable greenfeed in late August and September; it can be grazed as pasture if desired in October and November; in December and January it can be made available for emergency grazing of ewes and lambs, or for newly weaned lambs. In the summer and autumn it can provide both maintenance and fattening feed for lambs or adult sheep and in the autumn some flushing green-feed. It can be grazed hard for a period or it can be allowed to go completely unused for many weeks and be grazed in the full flowering and/or semi-wilting state. In the semi-wilting but not woody state, it is at its best as a fodder or fattening crop. It can be left ungrazed to flower and seed in bountiful seasons and if the seed crop is a failure no harm is done. Even a massive crop can seed and lie down with seemingly smothering effects without injury to the stand and the only unfavourable feature of lucerne is that in the luscious green state of growth it does not appear to be very palatable and sheep do not thrive on such feed, especially in wet weather. Also, it does not grow at as low a temperature as does ryegrass.

At Ashley Dene all uses have been taken advantage of except the unused massive seed crop remaining unharvested. Our full stocking policy and our desire to save even a few pounds of creeping lucerne seed is very demanding. In other words, lucerne can be grazed, hayed or seeded as required. It is the "buffer" fodder crop in semi-arid Canterbury. Its use then becomes one of general farm management.

On the Ashley Dene farm lucerne has played an increasingly important part in management. It quickly allowed turnips as winter

feed to be dispensed with and now in late August and September lucerne provides greenfeed. Last spring, at this period, only 34 acres of the total lucerne were not grazed. With early August lambing the only special greenfeed grown at Ashley Dene last year was 40 acres of new pasture and 33 acres of H1 rye and subterranean clover pasture. For next spring greenfeed consists of only 30 acres of new pasture and 70 acres of renovated H1 rye and subterranean clover pasture. Lucerne aided by spelled pastures provides the main greenfeed.

At Ashley Dene from October onwards areas not required for grazing are closed for hay (and silage). Last year the area closed was 126 acres, including 34 acres not used as greenfeed. The area actually cut was 64 acres. As you all know, the weather turned dry in October and by mid-November light land pastures with a full stocking policy became rather short of feed. Lucerne areas closed for hay with growth from nine inches to 18 inches high were brought into use for grazing at this time for ewes and lambs.

Some of you will recall the field day in November when ewes and lambs were "belly high" in lucerne in paddock 10. It was lucerne that met the demanding situation. It is true that with our full stocking policy winter feed requirements were being eaten into; but it was also true that in this record dry season with record stock numbers (1760 ewes and 1820 lambs, 450 ewe hoggets, 93 rams and wethers, and 20 head of one and a half year steers) there was the record of 760 lambs sold fat off the mothers in November and December; certainly at light weights (29-30 lb) and with 50 per cent. seconds.

As most of you know, "Canterbury never lets you down," and so our hay supplies have since been made up somewhat—but again, from lucerne hayed in March-April—sufficient to enable the carrying this winter of 1500 odd ewes plus hoggets. This is a cutting back of sheep numbers to that of 1952 and 1953. Given a normal spring in 1955 there will be no difficulty in conserving adequate lucerne hay for our next winter's requirements and in all probability in excess of one year's requirements. All we need at Ashley Dene is more lucerne and still more lucerne. Subterranean clover has built up this light land over the past 15 to 20 years and it is now in a state to grow good pure or mixed lucerne stands—lucerne that can be put to whatever use management dictates. The College policy is to continue to explore this avenue of increasing production at Ashley Dene.

In summing up, the first phase of development with subterranean clover and using lucerne as a hay (and silage) producer is over. It raised the stock numbers from 860 ewes to the equivalent of 2000 ewes. Using lucerne and lucerne mixtures for grazing is the second phase of development. It is now under way and should raise the present sheep numbers to still higher figures—perhaps over 2500 ewe equivalents.

As I see it, gentlemen, that is the Ashley Dene story with lucerne.

(e)

Mr R. M. Robertson, Hakataramea, North Otago.

The Hakataramea valley is situated between the Hunter Hills on the east and Kirkliston Range on the west, approximately 40 miles from the coast. The valley is roughly 30 miles long by five miles wide. Rolling, to flat, easily cultivable downlands comprise most of the area, with good tussock country on the steep hillside.

An extreme range of climatic conditions are experienced—especially in regard to rainfall.

The farm which I manage comprises some 3,000 acres of hill country and 375 acres of rolling country. One hundred and sixty-three acres is in lucerne, 64 acres in clover pasture and 100 acres remains in native grasses which is to be broken up and sown down in lucerne over the next ten years. The farm is seven miles from the rail and 40 miles from the town of Oamaru. The soil is a sandy loam overlying a porous clay pan. However, there is a good average depth of soil but it is very easily blown under dry conditions if worked too much. The property has a northerly aspect and is directly exposed to the notorious nor-wester. The average rainfall is 12 to 14 inches, and with an annual minimum of 8.95 inches it can be seen that it is extremely dry. The driest months are January and February. We carry 1,350 Corriedale ewes and 400 replacements plus rams and others.

My father took up the property in 1921. It was unimproved and lousy with rabbits, carrying 1,100 sheep. For six weeks each winter they had to be sent down country and put on to turnips. Today the property is carrying 1,800 sheep and wintering them well. With the total regeneration of the run country and the addition of lucerne the property will doubtless carry nearer the 3,000 mark. At present the lucerne is being used to carry as many of the present stock as possible to enable the hill country to regenerate. That the hill country is improving there is no doubt whatever. It is reflected in the greatly reduced runoff after heavy rain and the general increase in blue tussock on previously bare sunny faces.

The first lucerne sown on the farm was put down some 25 years ago. It was hand broadcast, covered with harrows, not inoculated, and the result was a perfect strike. No one would dare to treat a paddock similarly today. Topdressing was non-existent and lime not even remotely considered. It was used almost exclusively as a cow paddock. Although my father envisaged extensive sowings economic conditions and rabbits did not allow them to eventuate at the time.

The decision to sow more lucerne was made when the use of grass mixtures failed. They had to be shut up most of the summer to allow enough feed to accumulate to enable the ewe lambs to be segregated while the rams were out. We found that ryegrasses ran out in two years, clovers only produced in wet years and cocksfoot was the only grass to survive even moderate droughts. *Phalaris tuberosa* was not tried, as a neighbour with similar climatic conditions found that it was not as satisfactory as cocksfoot.

The establishment of lucerne has been spread over a three year period in each paddock. The ground has been ploughed in the late autumn or early winter and fallowed until the following December when rape and black barley were sown to fatten lambs. The ground was worked as soon as the lambs were off it and then left in fallow until a similar sowing next December. As soon as the second crop was finished the paddock was again worked and allowed to fallow over the winter when it was either harrowed or grubbed according to weed infestation. Lime was applied at the rate of one ton to the acre prior to sowing, which took place when the ground was considered suitable, that is, wet enough to allow the lucerne to strike within three to four days. In one case we did not sow until early March whilst in the other cases it was late November and early December. We have rolled the paddocks before sowing in each case and then again about a month after establishment. In all paddocks the seed has been sown with one hundredweight of reverted super, with subsequent dressings of one hundredweight of straight super-

phosphate each year in late July or early August. A second ton of lime is applied approximately one year after establishment. All paddocks have received the same seeding of approximately 12 lb inoculated seed. The first two sown, had ten pounds of cocksfoot and the last one only five pounds of cocksfoot which appears to be ample.

The young stands of lucerne were lightly grazed until the first spring after sowing and then cut for hay. This was done primarily for weed control. As the majority of weeds are annuals this first run over with the mower cleans the stand. The oldest stand is now going into its ninth year and is not showing any signs of weakening except in one or two small areas on dark sides or low-lying dampish areas, probably not totalling more than an acre out of the whole.

One paddock of nine acres has been used exclusively for hay and the others are only saved when conditions are favourable, which means an average yearly cut of around 2,000 bales. The lucerne is cut just before it comes in flower and if the weather permits is teddered, baled and stacked within a week. It is fed out in July and August from the stack. The sheep are brought into the feed. Stacks of hay will keep up to three years without covering and very little wastage is experienced because of the dry climate.

The management of hill country stock on lucerne presents many problems. However, once a suitable grazing rotation has been worked out most difficulties seem to rectify themselves. Hill lambs weaned on to lucerne do extremely well but we have found that unless care is taken to provide alternative feed, deaths will occur after six weeks from pulpy kidney and/or lack of fibre. For this reason baled hay is made available when lush growth appears after a heavy rain or in the spring, and the lambs are given occasional spells of a fortnight on the run country. This fits in ideally since at this stage the lucerne is usually coming away freshly from the crown and needs a spell to grow and harden. This same routine is followed in the spring when ewes and lambs are being grazed. Enterotoxaemia was a problem but is now guarded against by inoculation in the first autumn. When weather conditions are dry the stands are stocked with ewes and lambs until late December and then shut up to enable the stands to produce enough fed for weaning early in February. The stands are only very lightly grazed just prior to the start of the winter to enable the lucerne to produce approximately two inches of growth, but once the severe winter frosts have set in the paddocks are set stocked until the growth starts in the spring; usually late August. The hoggets are grazed on lucerne until they are shorn in November and then if weather conditions are favourable the stand is shut for hay. One point of interest is that one paddock has been grazed completely bare each winter for the last few years and suffered no apparent damage. The hoggets have been fed on it and naturally have eaten the lucerne right to the ground before taking to the baled hay exclusively. This particular stand has been down six years and is as good as when it was first sown and producing just as heavily as any of the others if not heavier, perhaps, due to the extra animal manuring it gets. I might add here that no attempt has been made to save any seed as yet. However, if in the future when we reach the objective of 350 acres in production and adequate hay is saved and other feed in good supply, one stand will undoubtedly be kept.

Since there are so many strains on the market just at present, it would be as well to mention varieties. We have only grown three: Certified New Zealand, Commercial Marlborough and Australian Hunter River. There is not a great deal to pick between these but there is one point I would like to make. It would seem that at present the criterion is to select a thin-stemmed, leafy variety. This:

is all very well for hay but under grazing management, which is becoming more and more popular, we think that we need some taller-growing and stalkier variety to provide more fibre. We believe that the time must come when we have different lucerne for different purposes such as I have just mentioned and also for early spring growth, late autumn and possibly winter growth. The breeding of deeper and shallow rooted varieties might further increase the potential area of lucerne. Such varieties do apparently exist overseas.

With the extensive use of lucerne a very appreciable increase in cover on the run country has already been noted and the establishment of clovers with the aid of aerial topdressing will ultimately follow when the paddocks are fully developed. At present we have trials on the dark and sunny faces of the run accessible to a crawler tractor. Lucerne and a variety of clovers were broadcast by a sun-prong harrow and if results are favourable we think that great possibilities present themselves. If lucerne can be established on the light slopes where cultivation to any extent is impracticable, it will mean a great improvement to soil utilisation and stock carrying capacity. An added advantage would be the fact that stock would be accustomed to lucerne and not require such a marked period of introductory grazing when put on paddock lucerne each season.

To conclude I would like to make a few general observations. Until 1946 there were only about 4,000 acres of lucerne in North Otago. At the present time there are more than 10,000 acres and most of this increase took place during the past five years. The results are far beyond the expectations of the previous generations and it is probable that 25,000 to 30,000 acres will be reached in the not too distant future. There is no doubt that such an increase will be responsible for a very large increase in agricultural production in North Otago.

I would like to mention varieties again. This will be to a certain extent "bearding the lion in his den" since I intend to disagree with some of Lincoln's recommendations. At present the varieties achieving most notable success in North Otago are Marlborough, French Provence, and New Zealand Certified. The New Zealand strains are most popular at present, but French Provence has proved itself very suitable to local requirements. It is somewhat shorter and denser than New Zealand Certified. Hunter River has been tried in several areas but in a few cases has not come up to standard. There has been considerable talk over the last few years of grazing strains, the most notable of which is Grimms. These grazing strains most certainly have a lower annual productivity and are not so early in the spring. The argument has been put forward that they last longer under grazing. This may be so but the markedly lower production under our conditions does not compensate for this.

In conclusion I feel that I can say that lucerne is one of the most stimulating things we have in North Otago and the most likely plant to rejuvenate our countryside.

DISCUSSION FOLLOWING ALL PAPERS ON LUCERNE

A speaker from Kirwee: What is the best time to shut a paddock for seed?

Mr Iversen: There is a wide variation of opinion about this overseas. Mr Zaleski of Cambridge, England, has done some useful work on seed production and made the following recommendations in the British Journal of Agriculture:

(1) The lucerne intended for seed should not be cut unless good summer growth is anticipated.

(2) Cut the crop when the seed is ready—it is not an economical proposition to hope to gather in, at the same time, seed from secondary flowering.

(3) The crop should be cut when 60 to 70 per cent. of the pods are brown.

Conditions are not identical in New Zealand and the first growth is usually hayed. There can be two or three flowerings in each season but conditions must be suitable for seed setting.

Mr Scott, Mid-Canterbury: How long is it before lucerne seed starts deteriorating from a germination point of view?

Mr Iversen: Buyers are safeguarded by P. and G. certification. Lucerne seed does not deteriorate quickly but it does depend on conditions of storage.

Mr Matheson, North Otago: I started growing lucerne seed five years ago. I read all the departmental literature and they said sow certified seed, so I did. I am being offered 8/- lb for the certified seed whereas I get 6/- lb for seed from a 20-year-old Marlborough stand. It seems to me that the merits of certified seed are not fully appreciated. I think research work on developing these improved strains is very important. Does Mr Iversen consider strain B is the best one to sow at present and does he know whether any other strains will be put forward in the immediate future?

Mr Iversen: Strain B is more productive in spring and autumn but is more susceptible to summer drought. It is leafier and finer in the stem. It ranks slightly higher than Marborough on Zaleski's scale. New strains will come forward from time to time.

Mr E. G. Smith, Department of Agriculture, Rangiora: When I was asked to make a contribution to this discussion, one thought came immediately to my mind—we, as farmers and agriculturalists generally, must keep alive to new developments. What we said and did two or three years ago is not necessarily the most up-to-date thing to do today. As a young man in Australia I remember expressing considerable surprise and grave misgivings on seeing a lucerne stand being grazed. It is always easier to question other people's practices rather than develop new ideas of your own.

Regarding sowing time, I like to sow my lucerne in North Canterbury about the end of September. If I am following the practice of summer fallowing I like to have the lucerne sown in late January or early February. It is most important to get lucerne away early. Experimental trials with seeding rates of three, six and 12 lb lucerne to the acre have favoured the heavier rate. There is no time like the present. Three pounds is particularly poor—six pounds fair —with 12 pounds you get high production and weed control right away. Possibly the situation is modified for creeping lucerne.

Professor Flay wondered whether he was being over optimistic for his 1960 stock figures but I have no doubt whatever that Ashley Dene will carry that number of sheep and more in or before 1960. At West Eyreton we are carrying two and a half ewes on land just as light as Ashley Dene and we got through this summer all right. If you did not have feed worries this year you must be understocked.

I agree with a lot Mr Robertson said. Phalaris does not appeal to me for light land. Cocksfoot is a blessing but it can smother out lucerne because it produces good growth under all sorts of conditions. Five pounds of cocksfoot in a lucerne mixture is too much, you can get away with it if it is well managed, but I prefer two or three pounds. Even one or two pounds is sufficient to dominate lucerne if it is mismanaged. Probably one of the highest producing pastures

in North Canterbury is on Dr Burns' home farm with a mixture of timothy and lucerne. It has not had special attention but is a very useful pasture; feed, hay and seed have been obtained from it.

Two subjects interest me, and I think need further investigation: the effect of lucerne on flushing, and the value of rollers for crushing lucerne for hay.

Mr Maddock, North Otago: I have had experience of the good initial lucerne strike and then sudden deterioration when the plants are about six inches high. Before you know where you are there are patches of dead lucerne. What is the reason for this?

Mr Iversen: My immediate suggestion is grass grub. It could be due to inoculation failure. It might be due to adverse soil conditions. Failure can be due to bacterial wilt, but your circumstances do not sound typical of that infection.

Mr Hunt, Chairman: I have experienced disappointing results with re-established stands. My old Marlborough stands were 25 to 26 years old and after a fallow and a greenfeed crop the paddocks were resown with certified seed. The present stands are neither so drought-resistant nor able to make quick recovery after grazing.

Mr Iversen: It is difficult to pin point failures with re-establishment. In very old stands natural selection takes place over the years and they become predominantly made up of plants most suitable for a particular locality and management. The certified seed has its limitations regarding summer drought periods.

We had an experience at the College which may be of interest. Lucerne was re-established after a short period of cropping and its lack of vigour gave some concern. A soil test demonstrated molybdenum deficiency and after it was applied the response was phenomenal.

Mr Hurst, Papakaio: You would be interested in our experiences with sowing rates on our irrigated farm. At one time we sowed 14 pounds per acre, that is seven pounds one way and seven pounds across. By way of experiment we sowed at three rates—ten, eight and six pounds. The lighter rates were just as successful. Does not Professor Calder think he is putting in far too much seed? I was at Ashley Dene two years ago and I contended with Professor Calder that his young lucerne stands were far too thick. What are these stands like today?

Professor Calder: The thick and thin stands referred to by Mr Hurst are both good. The seeding rates for hay stands are usually high, in order to ensure a good even strike; but for grazing they can be much lighter.

Mr Butcher, North Canterbury. Professor Calder says that he grazes phalaris at Ashley Dene. Does he have any trouble with phalaris staggers? Mr Walsh says he does not cover the drill when sowing lucerne. Does he have any trouble with thunderstorms washing the seed out? Why does not Mr Kennington use a direct header? I suggest that establishment failures account for the rather limited use of lucerne in Canterbury. We experienced this trouble until we worked lime into the soil prior to sowing.

Professor Calder: Replying to the query about phalaris staggers in stock. At Ashley Dene we use phalaris in a grazing mixture with lucerne and subterranean clover. On rare occasions where the preliminary symptoms of phalaris staggers have been observed the stock have been immediately shifted off the paddock. We have never lost stock from phalaris staggers. We tried to produce staggers by grazing a mob of wethers on the pasture continuously for three months, but they fattened just as well as the control group on ordin-

ary pasture. The condition has been prevalent in certain districts. It appears to be most common where phalaris is the dominant constituent of the pasture and is possibly more common in young growing sheep. It has been reported in Australia recently that phalaris staggers is associated with cobalt deficiencies and can be overcome by treating the land with cobaltised superphosphate.

Mr Walsh: Replying to my part of the question, I find that the seed is sufficiently covered by the coulters. Later I harrow to control weeds. I would offer a contribution to the question referring to direct heading. It is practically impossible to get a really good sample of seed if you have to contend with young green growth amongst that which you are trying to head. If the stand is cut, this young growth dries off within a few days and is not a problem.

Mr Kennington: Yes. I prefer to cut it, stack it and put it through a mill. I admit direct heading would reduce shedding loss.

Mr Griffiths, Agricultural Adviser to the United Kingdom High Commissioner: I come from an area in England where lucerne growing is particularly popular. At Home we found that we had considerable difficulty in establishing lucerne and this was one of the factors which limited its popularity. Five years ago we discovered lucerne adores potash and now we use some two to three hundredweight at establishment and this is followed by three hundredweight annually. Most of our lucerne is grown for silage, hay or dried grass and only comparatively recently has it been grazed. We are using lucerne in the reclamation of sand and heath land. This lucerne is grazed and the subsequential result is a steady improvement in fertility. With regard to Mr Smith's comments on seed rates, we go up to 20 lb. We consider the quick establishment of a strong stand very necessary economically. If you start with a weak stand you never seem to be able to improve upon it and weeds take control. We have found that cocksfoot can only be satisfactorily grown with lucerne if you intend to graze it heavily in summer and cultivate it ruthlessly in winter. It is not suitable for stands intended solely for hay or silage.

May I ask Professor Calder why he includes ryegrass in his mixture? I should have thought one or two really dry seasons would put paid to it.

Professor Calder: I think tradition insists I include some ryegrass in these grazing mixtures even on light land. Two years ago I included five pounds of ryegrass and that was too much. Now I have reduced it to two pounds—it does give extra feed in the first six month period and is a good winter producer.

Mr Smith: Farmers in England either buy cheaper potash or are wealthier than Canterbury farmers. I have done trials with potash in applications of one to two hundredweight but have had no response.

Planting in alternate rows does assist in the management problem, but it has its disadvantages. If the land is good I would have no hesitation in sowing the mixture, but if it is not perfect I would prefer to sow alternate rows. Various grasses present various problems of management. I have found lucerne and timothy very satisfactory if the land will grow timothy.

Mr Johnson, Otago: Please would you explain your preference for spring sowing, and would Mr Robertson tell me if he applied lime as a result of soil analyses recommendations?

Mr Robertson: We had the soil tested and were told that whereas it did not require lime for normal pastoral needs we should apply one ton for lucerne. We did this. On one paddock it was applied after sowing and on another prior to sowing. The later gave the best

results. Then we put a further ton on nine acres as a trial and as there was a definite response a further ton was applied to the whole area. Regarding the sowing of lucerne in the spring; I sow when the ground is moist enough. The seed must germinate within five to seven days or the inoculation will cease to be effective.

Mr Hurst: Sir William Davis in his book "The Grass Crop" quotes some first class farms in England using no more than five to eight pounds of seed per acre—and he is perhaps the greatest authority in the world.

The problem of barley grass has not been discussed. Building up fertility encourages barley grass. We resort to knocking back fertility by growing wheat. How about the use of sprays?

Mr Iversen: America is making exceedingly good use of a grass killer, Chloro I.P.C. applied at four pounds to germinating seedlings of barley grass and other annual weed grasses.

Mr Bedford, North Canterbury: How about controlling weeds by sowing in 3½-inch rows?

Mr Smith: That is quite a recognised method of control.

Mr Bonivant, Mid-Canterbury: Has Mr Topp any particular reason for preferring pure lucerne stands? Where were Mr Smith's potash trials carried out?

Mr Topp: I think that lucerne is a complete food. There is no other plant that I can grow on my land to produce anything like the quantity of food that lucerne does. So why take up space by planting anything else? There is some merit in a mixed diet but you get it soon enough even if it is not quite as desirable as one you would plant yourself!

Mr Smith: The potash trials were in North Canterbury and we had no response.

Mr Nutt, North Canterbury: I would be interested if Professor Calder could give us some figures comparing creeping lucerne with other types of lucerne.

Professor Calder: No, we have no comparative data yet, but the production figures I quoted in the paper for a seven-year-old pasture with creeping lucerne is a good indication of its value for light land pastures. A comparative trial is being run at Ashley Dene between creeping lucerne, Marlborough, Rhizoma and Nomad. In the meantime there is sufficient evidence that creeping lucerne has definite merits. We could not graze Marlborough as severely as we did the creeping lucerne this season without seriously weakening the stand.

THE MANAGEMENT OF FARMS WITH A HIGH PER ACRE PRODUCTION

1. THE MANAGEMENT OF HIGH-PRODUCING PASTURES

Dr P. D. Sears, Chief Pasture Ecologist, Grasslands Division, D.S.I.R.

So far as I know there is no simple formula for the management of high-production pastures. It is essentially a job of continual adjustments to fit the constant improvements in plants, fertilisers, water control, insect control and new knowledge about animal and plant husbandry, into a workable and profitable farming system. What we have to watch all the time is that we keep the many factors in balance without becoming over-emphasised on any one to the exclusion of others. We must realise that an increase of pasture production does not just simply result from applying something new or different. It calls for a continual adjustment all along the farm production line.

My approach to this question of good pasture management has been from several angles, as I fully realise that you cannot, in practice, get very far on a farm basis unless you have some knowledge of not only how to grow pasture, but also how to utilise this growth to the best advantage to the grazing stock and for the soil. For this paper, therefore, I propose to go very briefly through some of these factors and to give some of our results connected with them, and then to outline the farm and pasture management systems we are finding to be satisfactory to our conditions at Palmerston North. I say Palmerston North because I fully appreciate that local conditions in other parts of the country are very different, and probably call for different little twists and turns to fit best the local conditions of climate, soil, and stock requirements.

Considering these major factors I must say right at the outset that when I listed out the major points they all looked pretty simple and pretty obvious. However, as we all know the ace looks pretty simple and obvious, but it is certainly very helpful to get a few in your hand. I point out, however, that the fact that I have listed five major factors for consideration, is no reflection of my card playing activities! The factors that I have listed are: water control, the fertility cycle, pedigree pasture plants, grazing management for the balance of the pasture and animal needs, and weed and pest control. I have not got a written script, gentlemen, I am just working from notes, so my story will be a bit patchy.

Water Control

First of all, water control: we have not a great deal of data on results of good water control at Massey or at Grasslands, but good drainage is obviously a prime necessity on every high-production area. For irrigation, similarly, we have not any good comparative data. We have had some very good results from irrigation, but up there on heavy land we seem to be just on the economic line of whether or not irrigation will pay, particularly when we consider other pasture species such as red clover, and so on. We have a bit

of information though, on water control and on better water retention in the dryish weather, by considering, say, paddocks in which we do not graze the heart out of the pasture, compared with those where we graze it out right down to the ground. We do get a better moisture control, that is, more even moisture, where we keep the pasture more evenly grazed compared with where we chew the heart out of it in the summer. Another point on water control is the obvious one that where our soil structure improves, and if we prevent pugging, we do seem to get a better water position by getting a better water penetration and better water absorption. It seemed quite clear to me in some of the countries I visited when I was away recently, that in many places the soil structure had deteriorated very much and the rain that fell just did not get into the soil. I would list as the prime requisite for good high-production pasture and farming generally, the adequate control of the moisture, and making the best use of the local climate.

Fertility Cycle

The fertility cycle is a key factor to keep in mind, at least I think so, all the time that we are working, and we have to appreciate the particular cycle we work under in New Zealand. Essentially, as you know, it is to maintain the correct balance between our clovers and our grasses, by providing the appropriate mineral fertiliser to get the cycle going, by getting the dung and urine back to keep the cycle going, and by preventing losses of soil nutrients. We have carried out many trials on the several factors in this fertility cycle, at Palmerston, Lincoln, and at Gore over a long period. The general picture is the same at all these centres. Roughly speaking, it works out that a pasture established without any clovers is a poor pasture, and that such pasture soon degenerates to a very poor yield of about 1,000 lb of dry matter with only an annual turnover of about 30 lb of nitrogen per acre, just the small amount fixed by the free-living soil bacteria, and in the rain. There is no permanent mineral response on such pastures; superphosphate put on is just wasted and so are other minerals. When, however, we have the appropriate clover, we get an immediate lift not only from the clover but also the grass. At Palmerston North, for instance, a pasture of grasses plus clovers yields about 11,000 lb of dry matter per acre per year and the pedigree New Zealand white clover in that association fixes annually about 450 lb nitrogen per acre. That is equivalent to the nitrogen in over a ton of sulphate of ammonia per acre per year.

In this respect it is rather interesting to point out that the white clover is much better than the red clover for direct nitrogen fixation and transference to the associated grasses. We, at Grasslands, do not really value red clover in our pastures from the point of view of its nitrogen supply. We think all the time of trying to get white clover into the association, and we use the red clover largely from its summer feed producing ability. Not that red does not fix nitrogen, but most of what it does fix has to go through the animal before it really improves the cycle.

Such a pasture, however, just grasses and clovers without dung and urine on it, will give us clover dominance, and the grass growth is not particularly brilliant. It is, however, the essential basis on which to put our mineral fertilisers to get ourselves going.

The next phase in this cycle is to get the dung and urine from the animal back on to the ground which produced the feed, which in turn produced the dung and urine. It may seem a simple thing to say, but it seems to my mind that one of the biggest steps we can take in this country, is to get that dung and urine back uniformly on to the ground; to get adequate grazing control to make sure that we do not transfer fertility from one part of the farm to another, or one

part of the paddock to another. When we did this on our experimental trials, we lifted the production from 11,000 lb of dry matter to 14,000 lb of dry matter and the pasture turned to grass dominance; and by having such grass dominance we did get a better spread of production over the season. So there we have our complete cycle, the addition of the clover, the addition of any mineral fertiliser needed, and then the return of the dung and urine from the grazing animal, and we get a very productive balanced pasture indeed.

There is a further little point, that in the urine itself there are certain hormone products which give a direct control of weeds as they prevent the germination of weed seeds. So that there we have another effect as well. From this knowledge of this fertility cycle we can take all sorts of points for general application.

First of all is the obvious need for clovers, and in this respect I cannot emphasise too much the value of the New Zealand pedigree white clover compared with our "natural" strains. A pedigree white clover will fix about twice as much nitrogen as the "natural" strains. Then with fertilisers this cycle story will give us a better appreciation of what sort of pastures to put our fertilisers on. We may also need to balance up our fertilisers a bit better. We must consider the need for phosphate, for potash, for calcium, sulphur, molybdenum and all the others. With the dung and the urine it may seem a bit silly to try and say we can control it but in fact we can. For instance, we can keep our day and night grazing balance on our dairy farms; on hill country we can endeavour to get a better spread of stock around the hills, and we can counter the fertility transference under natural grazing, from the sides of the hills up to the ridges at night, by putting our fertiliser on the sides of the hills so that we are continually renewing that which is taken to the ridges by the animal. Then in the very important cropping side of the pasture rotation, we can use this dung and the urine from the animal, either to build up fertility to give us a good crop, or we can use it to take fertility down when we have cropped, or any other way to give us a decrease in nitrogen such as, for example, we like to have on some of our land when we are sowing down new pastures. If we do not want too much nitrogen in a new pasture we can take it down by day grazing only. This cycle, when it gets going properly and we are using our pastures not only for their own sakes but also for the increase in soil fertility, does give us a true build-up in soil fertility. When we have good pastures and we have plenty of nutrients going back, we have an increase in the earthworm populations in the soil and they in turn build up the soil structure and we are thus left with a very good soil for the growing of direct crops. At Palmerston and at the other centres, we did get a close relationship between the yield of pasture and the yield of subsequent crops. The better the pasture the better the crop and there was a direct relationship all along the line between the earthworm, the pasture, and the crop, and it may seem silly, but we can in fact get an estimate of our crop for the following year just by weighing the earthworms in the pasture soil; because they all depend on the same things.

At Palmerston it looks to me as though it takes us about four or five years to build up our soil to optimum soil fertility level. I do not know that we have any appropriate data on this, or adequate knowledge, but we are carrying out further trials at the present time and I think it is a very necessary thing to look at it from the point of view of using your pasture to build up for cropping, and not to plough a paddock when it has run out, but rather to plough out a paddock when it is *good* enough to plough and to grow a good crop. That is the attitude of mind at least, that I follow. I try, if I have a poor pasture, to make it grow a pasture sufficiently good to then

grow a good crop, which is a very nice thing to have and a very acceptable thing on any farm. It does not matter if it is a direct crop, or a forage crop, or a crop of hay or silage or of seed; we must look on pasture as the way of building up soil fertility.

Pedigree Pasture Plants

The next factor is that of pedigree pasture plants. There is no need for me to go over these in detail, Mr Corkill from our Division has given you full details of these plenty of times, but I would just point out he is still on the job and still trying to improve our pasture plants for the various conditions throughout the country. We are very lucky in this country, really, as we have now a very long range of pedigree species; perennial, Italian, and short-rotation ryegrass, cocksfoot, timothy, white clover, red clover, and now a start on the lotus group. Mr Corkill is making continual improvements on all these species. I think you will agree that we have now a very nice list and a very well organised seed trade handling seed under Government certification. Mr Corkill has further improved his short-rotation ryegrass recently; he now has much more persistence in it and the new model is much better than the older model in a dry summer. He is also working on a long-rotation ryegrass which is a bit nearer to the perennial and which will stand hard grazing better than the short-rotation ryegrass. So you can see that we are trying to fill on the plant breeding side the needs for our own particular regions.

Management

For the management of these pedigree strains one has to keep their requirements and limitations in mind all the time, and be prepared to adjust procedures as the strains improve, to make best use of them. First of all, the technique of the establishment of them on the farm is extremely important. We have done a little work in the last year or two on the sowing of such pastures. We are concerned with the seed rates and we are concerned with the early grazing management, and we have also been concerned with devising of machines for more efficient sowing, and also with the inoculation of the clovers. We have done quite a bit of work on this aspect on the raw pumice country near Rotorua, and although it may not apply on high production farms, inoculation is certainly a point to keep in mind all the way. We have found up there a very striking response to inoculation of clovers just the same as you all probably have for the inoculation of lucerne. Also, the roller-drill we worked out for that country we found very useful on other country, too. It is just a simple combination of a seed-box and a fertiliser box mounted on a roller with special built-up wheels. In this roller we used Cambridge rings with special built-up flanges in order to give us a sharp corrugation on the soil, so that we do then get the seed down in those corrugations to the moisture level; it strikes very well and we do not get disturbance by the harrows. We can, by using such methods, make a better use of the seed we sow and of course save seed. Not that it would be very popular perhaps to talk about such an aim in the South Island, where you grow most of the seed, but we are conscious of the cost of these things and the need for better efficiency in their use.

The early grazing of pastures we feel, is a critical stage, and we do take particular steps, and we have experimental data to show how necessary it is to take such steps, to control the early grazing management so that rapid early growth of grass does not choke out the clovers.

Having got the pasture established we then consider our general management pattern. This naturally depends on the district and on the species used. By and large, with our pedigree species when they get going well, we can lift the general level of grazing height very

considerably over that required for poor pasture, because of its continued palatability. This in turn gives us more growth and, as I said before, a better moisture control. So what we are really trying to do all the time is to lift our height, get more growth, and then at the same time utilise it to the best advantage because of its palatability. Roughly speaking, we are getting out of the stage of talking about spelling for this or the spelling for that, saving for winter and saving for summer or different times; what we are working up to all the time in our management systems, as I see it, is to lengthen our rotation between grazings, so that we can work on a simple long rotation around the farm. Roughly speaking, it works out that the better the species growth and the better the productivity of the pasture, so we can lengthen out the rotation and increase the height at grazing.

It is very easy to say this sort of thing, it is very easy to get up and talk about it, but as you know it is extremely difficult to do it in practice—to get just what you want. This is the tricky part of pasture management, just to work out that height so that you keep your palatability, keep your balance of species and still continue to get good utilization. That is where the art of the grassland farmer really comes in.

I think it is appropriate at this stage to bring in some data that we have on silage losses and prevention of losses in silage. Of all the filthy and unpalatable jobs on the farm I know nothing worse than the making and feeding of silage, but silage still is a necessary and essential part of high-production, so as to maintain a supply of feed which can be called on at any time any year, when growth conditions are not just right. In the past few years we have weighed over a thousand tons of silage in and out of silos and we are quite distressed about the losses; both the visible and invisible losses which do occur in New Zealand from our normal silage. A lot of us kid ourselves that we have good silage, but when we come to weigh what goes in compared with what comes out, it is *not* so good. The average loss works out at over 35 per cent. of dry matter. Then on top of that you lose some digestibility through such inefficient conservation practices. When I was in the States I met Dr Cowan who devised the system of using sodium bisulphite as an additive for silage-making, and he had very encouraging results. So when I came back I tried out some of this and my small-scale experimental results certainly bore out what he predicted. The losses which we recorded in the bisulphite silage were down to 20 per cent., compared with those in control of 37 per cent., and the material that came out of the bisulphite pits was very acceptable stuff indeed, and very nice on a chemical basis. It did not smell; which in itself is worth while spending a few bob on. So I think it is worth while keeping your eye on this sodium bisulphite process even though it may appear to be a bit expensive when you start. You have got to remember that saving silage is not done for the fun of it, and I do not believe all this story of surplus feed. I have never actually suffered a surplus of any feed, and I make silage only because it is needed for periods of shortage. You must have your reserves of feed, and if you want reserve feed I think it is worth while taking care to make it properly. So I think it is worth while keeping your eye on this sodium bisulphite practice.

The other little point I would like to bring into this section on grazing management is that of bloat control. We at Grasslands are very conscious of bloat as a major source of worry on high-production farms; mainly on dairy farms, but we also get a bit of trouble with sheep and run cattle. Bloat is a big hazard in the dairy world and it does sometimes prevent stockmen from increasing their production.

Lately we have had very good control of bloat both by intensive grazing, and intensive strip grazing to make the animals eat all the herbage down and thus they do not pick and choose the lush clover which apparently causes all the trouble. Secondly, by trying to maintain increased pasture height and thus getting more grass in the mixture and so keeping the clover under control. Sometimes we might even use a little bit of nitrogen for this purpose. Then, thirdly, we have just got on to using oil sprayed on to the pasture in order to break down the foam formed in the rumen. This is working out quite effectively. This then is another twist we have had to use on the management system on our little dairy farm at Palmerston North which I will tell you about. We have got to watch all the time, for example, one might be watching all the time for bloat, but we must also watch it all the time for other animal troubles, and for pasture growth.

Then there is the facial eczema problem: in the North Island at certain times of the year we have to take special steps on our pastures to avoid facial eczema, either by crowding the stock up very intensively on the dangerous regrowth on ryegrass pastures, or getting them on to some more stemmy material or on to some crop. So you have got to keep all these things in mind.

Weed and pest control

Weed and pest control is, I think, a very important matter on our high production farms. Weeds grow very well when the fertility increases. I personally cannot raise much enthusiasm over the use of sprays. I never seem to be able to strike it just right so that I get the nice results that you ought to get. But still it does not mean to say that they are not good things. I rather fancy the idea, if we are going to use sprays at all, is to try to use them on the field before we sow our pasture, and we have been working a little on the system of spraying the raw soil about a month before we sow in order to clean up the weed seedlings before the pasture is sown on them. Also, Mr Hyde and Mr Edmond at Grasslands have made a machine to spray weeds from the horizontal rather than the vertical. After a paddock has been grazed over, this machine is dragged along and sprays only the upstanding part of the unwanted weed, in our case, docks. It is a useful machine for that method of control. I like, myself, the idea of trying to grow the pasture to best advantage and thus choke out the weeds. I also use the mower in behind intensive break grazing; this is mainly of course on the dairy farm; we also get a measure of dung spreading by this mowing. The other way I try to keep the weeds under is to stop them getting established. Thus I concentrate more or less all the stock on one area in the winter, so that we make a proper job of pugging that area, rather than spreading our winter pugging all over the farm. At the same time with such concentration in the winter we feed our material out, our hay, our silage, and our crop; we feed that out so that we put further fertility into that paddock for the ensuing forage or direct crop. We then get a good crop growth and we cultivate to try and destroy the weeds that way. Just as a little example of the need for such weed control in crops I could show you a paddock of ours where you can follow the fathen now, where this weed was carted in during the feeding-out of a weedy crop. Pugging and opening up of a pasture in winter undoubtedly lets a lot of weeds get going.

Finally, on pest control we in the North Island are not as alive yet as you are down here, to the need for adequate control of insect pests such as grassgrub and porina and so on. But we are waking up and we have certainly awakened up quite a lot more this year. We had quite a dry spell this year and I put D.D.T. on some paddocks for grass grub control. I do not know yet about the grass

grub, but I did get a very good clean-up of all sorts of odds and sods of insects that are apparently hanging around all the time. I think we have got to be more alive to the need for such insect control. I do not think we want to wait until the pasture completely fails and the birds come along and tear it all off; what I do not like, and what I am watching for all the time, is the incipient sort of attack by grass grub. H1, for example, seems to be particularly liable to grass grub attack and although you may not see a paddock cleaned right out, I think that sometimes you can see a change-over from H1 to cocksfoot, or to browntop, due largely I think to the activities of these animals. I think we have got to keep fairly careful watch on these insect pests all the time, and even though we do not always see very obvious signs in the field I think we have got to keep chipping at them to try to keep them under control.

Application of general principles

The application of these general principles I have been going over, are obviously different in every part of the country, that is even if you agree with them, but I think they are basic to our better knowledge of pasture management.

Just as an example of what we are doing up at Grasslands at Palmerston North I can point you three little examples in which I have some personal connection.

First of all we have our Te Awa block, our hill country block at the back of Feilding where we have been trying to improve pasture from the points of view of production of stock and also the prevention of erosion. We have done extremely well on that block. Mr Suckling has been running it and he has lifted the carrying capacity, in about six or seven years, from one and a half ewes up to over four and a half ewes. The secret on that farm, we feel, is first of all subdivision. We divided it into small areas, experimental areas down to ten acre paddocks. We have broken it into sunny and shady faces for control of the stock, and for making sure that they stay on the paddock where they eat. We have oversown it with clovers and superphosphate. We have proved to our satisfaction that phosphate was in fact in shortage and we have put that on. We have put it on the clover, and made sure that we first put it on to the hillsides and not on to the stock camps. Specifically in that place we have put the material on to the areas which we considered were being bled. For the oversowing of clovers, we first grazed down hard and then kept it under continuous hard grazing after the clovers were established, and those clovers did extremely well. Then in some paddocks we have had strikingly good results by allowing the clovers to reseed and so build up a population of hard clover seed in the ground. Therefore we now have a nucleus of plants and seed in those fields and the palatability and productivity of those fields is improving—improving so much so that now we are putting some good grasses into them. We have, in fact, on that quite hilly country managed to get good growth of H1 ryegrass, which is quite a feat considering the early low carrying capacity of it. Now that we have our pastures established well under that continuous grazing system we are swinging over to a combination of rotational and continuous grazing to fit in best with the stock requirements. The essential points are: subdivision, the oversowing, and the watching of plants themselves and the management of them.

The next example is on some small experimental blocks that I have been playing around with at Palmerston, Lincoln and Gore to try and find out what systems of grazing management fit in best for the local conditions. At Palmerston, after trying several of them, I have whittled myself down to a couple. One is a normal

practice of the Manawatu district, using perennial ryegrass and white clover and hay conservation. It is a very good block. We do not plough there at all. We have built ourselves a very nice pasture, though it is weak in the winter. Winter growth on those pastures and early spring is weak, and in a dry summer the pasture is not as palatable as we would like it for our lamb production. But still it is a good basic sort of system to work on and not much trouble either. The next one I am working on involves a pasture and crop rotation. I am using a rotation there of nine years under pasture and the idea is to use H1 and red clover to the best advantage for the first few years and then finally come into perennial ryegrass and white clover; then I plough that up and take a direct crop. I took potatoes, for example, after nine years in good pasture up there last year and had a good crop averaging over 20 tons per acre, which is quite acceptable, at least in our part of the world. We get good forage crops and also good kale crops, and that is the sort of cropping end of the cycle which I am looking for as well as the grass.

We do not really need summer feed crops on the sheep farm, so much as on the dairy farm. Thus with sheep we can take a direct crop. The mixture I use on that rotational block is cape barley, H1, white clover and red clover, and a little perennial. My idea for that mixture on that farm is that the first year I get the barley, and then red clover in the summer for fattening lambs; the second year I get a little less red clover, and then for the next three or four years I get good H1 and white clover, and even if I knock it about a bit, I have perennial rye to finish up with, so that I then have a paddock to do stock hard on in the final year. It has worked out quite well so far. The general system I work on, as I have said before, is taking the paddock I am going to plough and doing it quite hard in the final winter by feeding out all stock on it. I do not mind knocking it about—in fact that is what is being done now—and while they are on this paddock they get hay and they are taken out daily for a few hours on grass round the farm. On those little blocks I am at present running 11 ewes to the acre, and we are getting quite acceptable lambs from them. Last year we got very good lambs.

Finally, we have a small dairy unit we are running in collaboration with Massey College. Mr John Nalson of the Dairy Husbandry Department of Massey is the responsible officer from Massey and we both work under the whip of Professor Riddet. On that 31 acres we now carry 31 cows and their replacements of young stock, six heifers and six calves; this year we will finish out with 360 or over pounds of fat per acre. We are using almost exactly the same rotation that we are working on the little sheep block but we do not include perennial ryegrass in our mixture. Our basic mixture there is short-rotation ryegrass, white clover, red clover, and we budget on a ten-year rotation. This year we have had quite a bit of worry as we have had a dry season and the short-rotation ryegrass has suffered a set-back. We have oversown quite a lot of new short-rotation ryegrass and we have had extremely good results using a disc drill or Blackmore coulter.

So that is about the strength of it: we fiddle round all the time trying to get the best and trying to sort out in our own minds the principle of the thing, and by talking with our farmer friends we are trying to work out what would be the best to use in their area. In exchange we get their contributions to us, and that to my mind just about typifies my attitude towards this intensive pasture management. All it boils down to is to try and get ourselves set in what are the principles of the thing, make sure we know which way we are going, and then at any time we can change our minds but not aimlessly.

DISCUSSION

Mr Hunt, Chairman: Could Dr Sears give us any information on pasture plants for our South Island ranges?

Dr Sears: The Botany Division and the Department of Agriculture are carrying out investigations for the tussock high country.

A speaker: Would the inoculation of clovers be advantageous on our hill country?

Dr Sears: Inoculations were found necessary for subterranean clover and white clover establishment on raw pumice. Local bacteria seemed reasonably satisfactory for red clover. Commercial cultures are available as well as those obtainable through Plant Diseases. It is certainly worth while on country that has not grown clovers before, either raw country, new country, or country that has been extensively cropped.

Mr Grant, Waimate: What experience has Dr Sears on the effect of rainfall (or moisture) on the palatability of perennial ryegrass. I farm in an area with a 23-inch rainfall and sow only Italian ryegrass because of unpalatability in perennial ryegrass.

Dr Sears: Rainfall certainly limits the use of perennial ryegrass from the palatability point of view. H.1 ryegrass was bred specifically to fill the gap between perennial and Italian strains.

Mr Bedford, North Canterbury: Would it not be to our benefit if we could disturb the gulls at ploughing until such time as the earthworm has returned underground?

Dr Sears: Yes. And they might leave their little bit behind them when disturbed!

Mr Whittlestone, Otago: Has D.D.T. any ill effect on the earthworm?

Dr Sears: D.D.T. is not harmful to earthworms. Experiments have been done and in no case have harmful effects been demonstrated.

Mr Iversen, Lincoln College: In wet seasons Canterbury experiences unthrift in sheep, and in particular lambs, on pastures rich in white clover. Is Grasslands doing any work on this?

Dr Sears: No experience. I think lambs do well on white clover, but surely Kirwee was established to investigate particular problems such as this?

Mr Iversen: Yes. But Kirwee is now closed and an outbreak occurred two years ago.

Mr Scott, Mid-Canterbury: (a) What would be the maximum number of sheep in the heavy stocking capacity on the one acre paddocks, and when would the sheep revisit the paddock? (b) What effect have commercial sprays on earthworms? (c) Would dried grass have a place in New Zealand?

Dr Sears: (a) Stocking rate works out at 100 sheep per acre, roughly speaking, with a three weeks to a month circuit. (b) I do not know anything about the effect of sprays on earthworms. (c) The economy of dried grass production is a question of power costs. We would be quite fortunate as we can grow a high quality clover pasture, but the power supply is quite against it. Mr Iversen has just returned from overseas and may be able to contribute.

Mr Iversen: I cannot give any figures. My impression is that dried grass in New Zealand would cost two or three times as much as the fat lambs, wethers, milk and beef that we can sell.

Mr Whittlestone: Is it possible to obtain a diagram of the Roller drill?

Dr Sears: There are Roller drills in production overseas. Essentially it is built-up Cambridge roller with fertiliser and seed box fitted. The seeds fall into the corrugations and are therefore in direct contact with the moisture. In some models a second roller covers the seed, in others a light harrow. The soil must be just right, however, light and fairly dry.

Mr Leitch, Department of Agriculture: Can Dr Sears explain the technique used in arranging the breaks to ensure the best use of the 6 to 8 inch pasture?

Dr Sears: The breaks are approximately half the length of a cow to minimise soiling. This is quite easy with fairly lush high producing pasture but it is time consuming. Mr Long of Levin has been following this technique for 10 to 12 years and secures very high production. It is necessary to organise the layout to prevent an over concentration of fertility at the gateways and back grazing should be controlled.

Mr Leitch: This type of grazing brings about an unnatural condition of overshading. What are the experiences of pasture species selection brought about by this system of grazing? We have found that a perennial ryegrass, cocksfoot, clover pasture becomes predominately cocksfoot after three years.

Dr Sears: Yes. Perennial ryegrass, fog and similar grasses do weaken and there is a definite effect on sward density. You have to guard against overshading H.1. The management of red clover is particularly tricky in its season of active growth. One can over-sow to rectify this loss.

2. FARMER EXPERIENCES WITH A HIGH PER ACRE PRODUCTION

(a)

Mr Alex Henderson, Invercargill.

It is perhaps easier to achieve high production on a relatively small farm. It is easier still if the farm is situated in an area of reliable rainfall. The farm I am going to describe is a small straightforward fat lamb farm of 157 acres and is located about five miles east of Invercargill where the rainfall is about 45 inches a year and is well spread.

The soil in that area is a loam, eight to twelve inches of it over shallow clay which lies over white quartz gravel and sand. There is some peat in hollows. All the farm is flat and ploughable although it was only recently that the last small block was drained and ploughed for the first time out of swamp. The whole farm has required draining and there is an extensive system of open ditches, tile and mole drains.

The farm is divided into sixteen paddocks of four to twelve acres. About one-third of the fences are planted with gorse and there are about 30 chains of young and old *Pinus radiata* which give good shelter. Of the total area, nine acres are in seed cocksfoot, nine acres are newly ploughed out of swamp and five acres are occupied by buildings and plantations.

Pastures vary a good deal. Sixty-four acres have been down more than ten years and some of these pastures are not good. The seed quality in the first instance was poor and seeding was invariably done under an oat crop, which itself was always good but which led often to very slow and probably poor establishment of pasture. Some ten years ago the last oat crop, one of 91 bushels, was grown. A year or two before this a change had been made to a grass mixture based on certified perennial ryegrass and certified white clover and about 1946 short rotation ryegrass was added to the mixture. Pastures sown with certified seeds comprise 23 acres between five and ten years old and 38 acres less than five years old and the balance of the area, about 13 acres, is under the plough for swedes and chou moellier. The pasture mixture sown of recent years is per acre: 30 lb certified perennial ryegrass, 10lb certified short rotation ryegrass, 2lb certified white clover and 2 lb of timothy.

A pasture is generally sown after three years' cropping with swedes and chou moellier and during cropping one ton of lime and four hundredweight of super are applied each year. Before grass is sown a further ton of lime is applied and seed is then broadcast with two hundredweight of super so that in four seasons' cultivation land going to pasture receives four tons of lime and 14 cwt of super. As an established policy all pasture is topdressed annually with half a ton of lime and two hundredweight super per acre.

There is nothing out of the ordinary in the way these pastures are managed. The aim is to keep them very short and as growth gets well away in October-November, some 12 to 14 acres are shut up for hay. In December-January all pastures are topped. Since rainfall is reliable it is safe to keep pastures very short and while this may not be the best treatment, as far as the grass is concerned, it seems to be to the liking of sheep and lambs.

In Southland crop feeding in winter is a real necessity. A small area of swedes and chou moellier may be expensive to grow but the crops are safe, yield well and allow the majority of the farm to be

spelled throughout June, July and August. About 12 acres are usually in crop and with 1,000 to 1,500 bales of hay this acreage is usually more than sufficient to winter about 700 sheep. In fact two to three acres are usually sold for feeding off.

Now for stock. Previous to 1944 the farm carried an average of 41 milking cows, ten head of other cattle and 200 ewes. In the last year of dairying, production was 13,272 lb of butterfat and 250 fat lambs and this comes to 84 lb butterfat and 60 lb of lamb meat per acre. In 1944 the whole of the herd was sold and the ewe flock increased to 550 or three and a half ewes per acre. Numbers have steadily increased and last winter nearly 750 sheep, four and three-quarters per acre, were wintered, while this summer the farm carried 726 adult sheep and 987 lambs, a total of 1,713 head, or 12 per acre. There are four or five head of cattle on the place but I do not think they make much difference to the situation.

The general plan of sheep management is to buy in full-mouthed Romney ewes in March. As a rule young ewes get too fat on this country and are not a good proposition. Old ewes of hill country or harder flat country are more satisfactory and easier to manage and some of these full-mouthed ewes do a second year. Ewes are mated to Southdown rams in April and are run in together for crop feeding which starts about the end of May. They are given hay earlier than this, as much as they will eat and as soon as they will eat it.

In the first week of September the ewes are drafted off into small mobs and go to paddocks that have been spelled all winter. With short rotation ryegrass in the mixture grass comes away early and there is usually a good fresh bite by this time of year. There is seldom any trouble with sleepy sickness and I think it is the early grass that saves the situation. Lambing begins about the first week in September and ewes not lambed at docking are run off and lamb separately. The first draft of lambs go off in mid-January and in the last two years lambs remaining at this time have been weaned. Previously they were weaned in late February or early March after a second draft off mothers. A third draft goes in early April and the remainder early May. At weaning ewes are mouthed and those culled go off fat in a few weeks. Shearing is in December or January.

Lambing percentages are always interesting and the most conservative figure that can be calculated is that based on number of lambs drafted fat, to ewes put to ram. In the last four years these percentages have been 116 per cent., 125 per cent., 126 per cent. and 131 per cent. Docking percentages would be about five per cent. higher than this.

Usually a little over 40 per cent. of the lambs go in the first draft and before early weaning some 60 per cent. to 70 per cent. were fat off mothers. Over the last four years the first draft has averaged 35.8 lb and over the season the average weights for the whole lamb crop vary between 35 and 38 lb and the percentage first quality is mostly between 98 per cent. and 99 per cent.

Using an acreage of 143, which includes all land except unusable swamp and land occupied by buildings and plantations, the per acre production of lamb meat has been 179 lb in 1951-52, 200 lb in 1952-53, 217 lb in 1953-54 and this year reached 248 lb. There is little doubt that a high lambing percentage is necessary before these levels can be reached.

With high lambing percentages, old ewes and heavy stocking, one cannot expect high class wool. Generally the clip average runs about 46/48s, but this depends on where the sheep were bought. Wool does not grade very high but is about average for old ewes. If the summer is wet then it comes off rather yellow and as would be

expected, there is a proportion of cotted fleeces. In 1945-46 when 510 ewes and ten rams were shorn the average clip per head was 9.6 lb and this gave a per acre production of just on 35 lb. In the last four years average production has been just under 10 lb per head and production has steadily risen to 43 lb per acre in 1953-54 and in the past season to 51.7 lb per acre.

SUMMARY OF LAMB PRODUCTION

Season	Number of lambs drafted 1st	2nd	3rd	4th	5th	Total
1951-52 ..	270	224	127	83	5	709
1952-53 ..	374	99	225	80	40	818
1953-54 ..	345	219	223	38	—	825
1954-55 ..	320	293	230	65	60	968

	Per cent 1st Quality	Total Weight lb	Average Weight lb	Meat per Acre (143 ac.)
1951-52 ..	98.4	25589	36.09	179
1952-53 ..	97.4	28574	34.93	200
1953-54 ..	99.0	31090	37.68	217
1954-55 ..	98.1	35520	36.70	248

SUMMARY OF WOOL PRODUCTION

Season	Sheep shorn (includes rams)	Total Wool lb	Average per sheep	Wool per acre lb (143 acres)
1945-46 ..	520	4980	9.6	34.8
1951-52 ..	597	5797	9.7	40.5
1952-53 ..	643	6350	9.9	44.4
1953-54 ..	643	6189	9.6	43.3
1954-55 ..	726	7392	10.2	51.7

The fact that wool production per sheep has remained steady at about 10 lb, even though ewe numbers have increased by about 50 per cent. over the past nine years, is, I think, a good indication of a real improvement in the carrying capacity of the farm. There is room yet for improvement.

(b)

Mr C. A. B. Pilbrow, Coldstream, Ashburton.

Before describing the actual methods used in working this property I intend to give briefly some of the reasons for changing older methods and the background leading up to present practices.

For my own satisfaction farming as a livelihood had to meet the following conditions. It had to produce enough money for:

(1) The maintenance of stock, plant and soil fertility;
(2) The employment of good and sufficient labour;
(3) Enough capital to provide for the expansion in stock and plant;
(4) A high personal income; and
(5) Income had to be reasonably constant.

Eleven years ago I acquired a small property of 186 acres in the Coldstream district of Ashburton, ranging from good to light land and

in a low rainfall area of approximately 22 inches. My first harvest was 70 acres of wheat, 24 acres of peas, and returns from 100 ewes. The result was such that immediate changes were necessary.

A close look at the figures showed that although individual paddocks showed quite good returns, the average yield per acre taken over the whole farm was low—about £10 per acre. So I decided to try and lift the average cash yield per acre over the whole farm to £20 or to increase the total yield by approximately £2,000. It was obvious that crops showing a low cash return such as wheat would have to go except in special circumstances and that the grassland portions of the farm would have to produce considerably more. I decided to try grass-seed production in conjunction with an increased ewe flock. I sowed 16 acres of lucerne as the basis for winter feed and for summer green feed, and during the next two years sowed most of the farm with grass of various sorts and lifted the ewe flock to between 300 and 400. After three years I realised that too great a reliance on grass seed could easily lead to disaster mainly because of the risk from blind seed infection; possible losses from weather conditions during harvest and variable seed prices, but that seed taken as a method of disposing of the lush growth as a result of heavier stocking showed great promise. I found that the build up in fertility as a result of hay feeding up to 500 ewes on small paddocks during the winter months practically eliminated blind seed infection from any farm and lifted the average yield of grass seed to about 50 bushels.

When paddocks required ploughing we normally sowed peas followed by grass immediately after harvest; occasionally we took two crops of peas or followed with wheat. Soil types of various paddocks do enable some variation here to allow for a green feed crop. On paddocks unsuitable for crops, my practice was to plough and sow straight back to grass but I found that weed grasses tended to invade the pasture too quickly and at present I am experimenting with turnips and following either with a short fallow or spring sowing of grass. The main point being to have the various paddocks out of grass for as short a time as possible so that sheep can again be used to build up fertility.

In 1951 my farm utilisation was:

TABLE I

Land Use and Production—186 acres: Season 1951-52

	Acres		Acres	
Peas	12			
Wheat	20			
Greenfeed to fallow to new grass	12	Crops and cultivation	127	(70%)
Lucerne (hay and grazing)	16			
Cocksfoot seed	10			
H1 rye seed	16			
Perennial rye seed	32			
Clover seed	9			
Grazing	56	Sheep and fat lambs	56	(30%)
House, plantations	3		3	
Total	186		186	

Summer carrying—

400 ewes and their lambs
130 hoggets
8 rams
12 killers

550 sheep, i.e., equivalent 485 ewes and their lambs = 8.7 ewes and their lambs per acre of grazing.

Winter, 1951—

425 ewes
220 hoggets
20 rams and killers

665 total.

In 1952 a further block of 200 acres became available and I took possession in June. I was fortunate in being allowed to do some work on this place prior to possession. I set out to try and put into practice some of the lessons I thought I had learnt to see just how quickly I could get this block producing returns somewhat similar to my first endeavour.

A close survey showed that three jobs had to be done quickly and in conjunction with each other, namely:

(1) Additional fencing;
(2) Water supply;
(3) Pasture development, and the liming of the whole area.

It was essential that if I was going to run a lot of sheep on these paddocks that water should always be freely available, especially during periods of hay or straw feeding. Accordingly I laid a pipe line across the farm.

We sub-divided four paddocks, and during the three years have erected or removed almost three miles of fencing as good fencing is the keystone to effective control of pasture and also contributes materially to ease of working the property. Three hundred four and six tooth ewes were bought, plus 450 hoggets, so that full advantage could be taken of the turnip crop sown prior to possession. Both ewes and hoggets were grazed on turnips until September with the addition of small amounts of hay which I had on hand.

The very dry spring was followed with light cuts of hay, but under these conditions seed and lucerne can be grazed more than usual to help out the feed position. The lambs did not do particularly well, probably being pinched for feed at certain periods, but most were killed at about 32 lb.

The ewes were fed on straw at various times from mid-December and because we considered that it would eventually rain, the ewe flock was again increased to 585 and subsequently to 637 plus 550 hoggets. There is now only one original paddock left which is largely being used as an experiment and has great value as an old pasture. Even after 18 months of dry conditions most paddocks are still in a condition to make vigorous growth when rain comes.

From this first winter onwards maximum sheep numbers have been carried. To ensure this, hoggets were wintered and sold off in the spring in favour of grass-seed production. The general policy has been to plough inferior pastures for peas or turnips. The pea area was usually followed by wheat, greenfeed, oats or fallow and to new grass. The turnip area, being lighter land, generally was put straight into lucerne or pasture. Liming and top-dressing, using

D.D.T. super, have been important features of management, together with the saving of about 2,000 bales of lucerne hay annually. Hay requirements along the coast where there is always some winter growth, are less than further inland. In the autumn the ewes were run on the stubble as long as possible and sometimes fed second class hay and straw. This allows the heavily grazed pastures to recover. The full use of grazing and pickings from all crops, cultivations, and seed areas is an important feature of sheep grazing management.

After three years the 386 acre farm utilisation for the 1954-55 season was:

TABLE II

Land Use and Production—386 acres: Season 1954-55.

	Acres		Acres	
Peas	20			
Fattening feed—turnips	6			
Wheat	27			
Greenfeed to fallow to new grass	12			
(Plus 12 acres grass to new grass and 20 acres peas to new grass)		Crops and cultivation	188	(51%)
Turnips	10			
New lucerne 15 acres and lucerne 46 acres	61			
H1 rye seed	12			
Perennial rye seed	30			
Clover	10			
Grazing	181	Sheep and fat lambs	181	(49%)
Plantations, homestead, etc.	17		17	
Total	386		386	

Summer carrying—

1070 ewes and their lambs (1240)
400 hoggets
54 rams and killers

1524 total
3 cows

i.e. equivalent 1305 ewes and their lambs = 7.2 ewes and lambs per acre of grazing.

Winter, 1954—

1100 ewes
600 hoggets
74 rams and killers

1774
3 cows

Feed—
15 acres turnips
2000 bales lucerne hay
250 bales grass-seed straw

It will be seen from this that the stock numbers have shown a steady increase and, in fact, are now considerably in excess of those carried in 1951-52, while there has only been a 20 per cent. drop in the acreages of seed and cash crop. The steady rise in lucerne acreage on the light land is a point worth noting, but at this stage I doubt whether we can really place a true value on D.D.T. in making possible the establishment and maintenance of pastures which make possible the carrying of large numbers of ewes to the acre.

TABLE III

Showing Sheep Numbers, Feed Supply and Grazing Capacities.

	Sheep Wintered (Ewe equivalent)	Winter Feed	Available grazing Nov.-Dec. (acres)	Available grazing Nov.-Dec. ewes and lamb per acre
1951	555	Nil acres turnips		
(186 acres)		2000 bales hay	56	8.7
1952	1025	17 acres turnips		
(386 acres)		2000 bales hay	145	6.1
1953	1240	16 acres turnips		
(386 acres)		2000 bales hay	173	6.8
1954	1490	15 acres turnips		
(386 acres)		2250 bales hay	181	7.2
1955	1493	10 acres turnips		
(386 acres)		1300 bales hay		

Table III shows the actual numbers of ewe equivalents carried on grass and lucerne during the cropping period.

It has only taken three years to arrive at this stage and in my opinion it will do even better as the benefits from stock become really effective. There would seem to be no reason why the 8.7 ewes and their lambs per acre of grazing in November-December cannot be attained with the larger farm and the greater percentage of the farm devoted to sheep.

I think it can be said that the new block is now in a position to contribute its share towards supplying the requirements I mentioned at the beginning of this paper.

(c)

Mr B. H. Palmer, Lochiel, Southland.

For two reasons I feel a little apprehensive in presenting this paper. Firstly, the production figures of my farm at present are only good average for a district of high producing and well managed farms, and secondly, the completion of my first production objective is not an accomplished fact. It will not be until the end of next season that I will be sure that the management measures I have adopted are as successful as I anticipate. The objective is the carrying on my 204 acres a flock of 1,000 ewes (I brought the number up to 1,005 ewes this winter) producing at least 1,250 prime lambs of approximately 35 lb, plus 12,000 lb weight of wool, and carrying a small mob of young cattle. In other words, 220lb lamb meat, 20 lb of cattle meat, and 68 lb wool per acre.

The farm is situated on the main road between Invercargill and Winton and is typical of that Southland Plain country. The soil is loam over clay over blue gravel, or just loam over blue gravel. The westerly portion of the farm is inclined to be light and gravelly, and is naturally drained. The east is heavier land and broken by a ditch receiving several tile drains.

The farm was purchased in 1949. It was carrying 850 ewes and was considered an economic unit. The pastures, with the exception of one or two, were predominantly of dogstail and white clover, and were certainly not in full production. The fences in the main were far from sheep-proof.

I would like to express my appreciation of the Meat and Wool Boards' Economic Service for assisting me to compile the production data (which includes an estimate for this season) and the farm plan.

MEAT AND WOOL PRODUCTION, 204 ACRES

Year	Sheep wintered	Wool per acre lb	Wool per sheep shorn lb	Meat per acre lb	Lamb meat per acre lb	Lambing %
1949-50	873 ewes	48	8.5	176	176	121
1950-51	872 ewes	63	10.9	205	189	130
1951-52	910 ewes	63	9.6	230	199	120
1952-53	803 ewes 210 hoggets	69	12.0	206	155	131
1953-54	800 ewes 214 hoggets	68	11.6	223	176	131
1954-55	805 ewes 304 hoggets	72	11.8	209	170	125
1955-56	1005 ewes	68	12.0	241	214	125

NOTE:

1. In the first three years all replacements were bought as ewes. In the next three years replacements were bought as ewe lambs. This year cast for age ewes were purchased.
2. Beef was produced, 1953-54 4,730 lb and 1954-55 7,550 lb.
3. Estimated figures were necessary for some in 1954-55 and for those in 1955-56.
4. In 1952-53 the wool produced represents 14 months' growth.

Up till now no set method of management could be adopted as each year a fresh programme of improvements was introduced. I need not go into details in describing the sub-division programme, but should perhaps draw your attention to the farm lane which although not a normal sheep-farming practice, is one which I am sure produces dividends.

To give you an indication of how the farm has been and will be managed, the system adopted in the season 1954-55 is worth quoting. The stock on the farm on 1 March, 1954 was, as follows:

Ewe Flock: 800, consisting of 200 two tooths, and the remainder mixed aged ewes. (It is conceded that the lamb meat production could be increased by at least a ten per cent. lambing improvement if four-shear ewes were purchased as replacements, but I am satisfied with smaller production and smaller financial depreciation on the ewe flock. The purchasing of genuine four- and five-shear ewes in Southland creates a major problem, the fat lamb country requiring many more old ewes than are available from the existing store-sheep country.)

Ewe hoggets: 300.

Dry sheep: 20 Southdown-cross lambs, 20 Southdown rams.

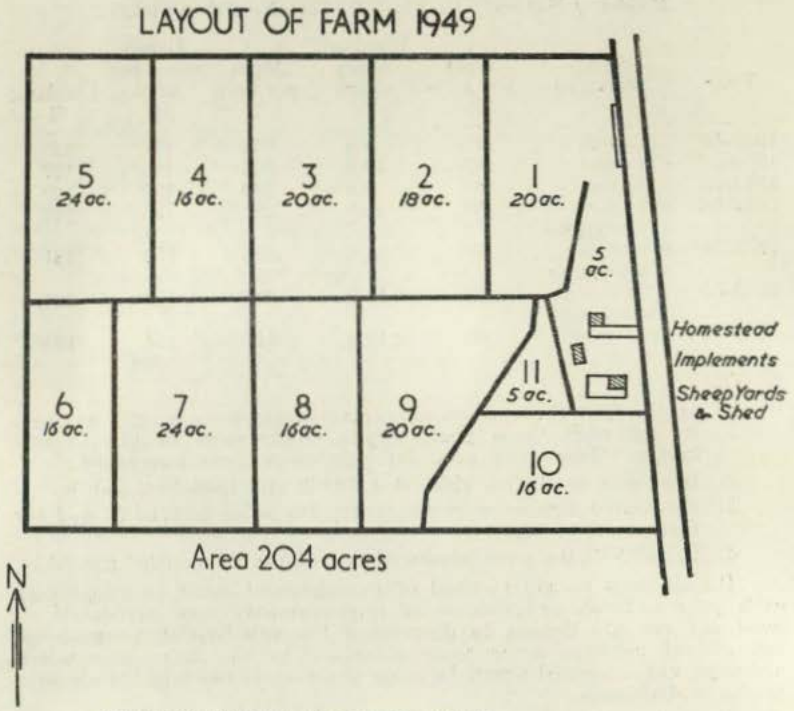
Total sheep: 1,140.

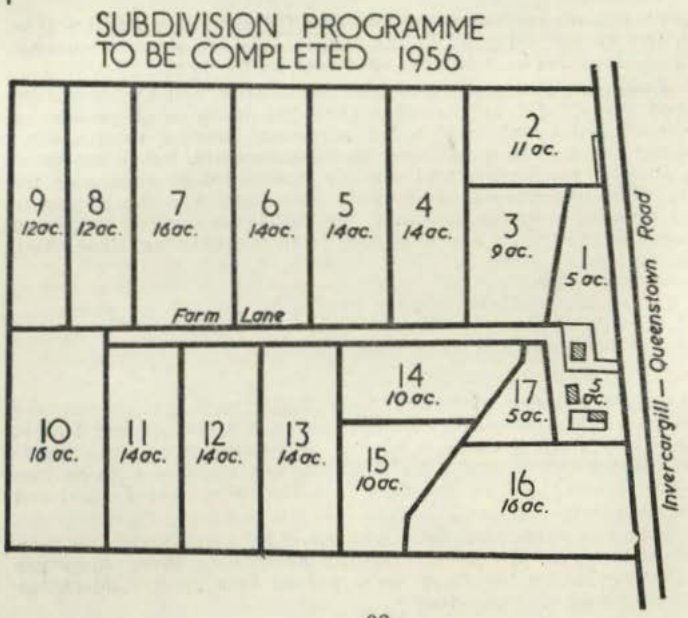
Cattle: 19 beef calves, 1 dairy cow.

Management of Ewes

Only the worst cases of footrot were hand treated, the remainder being run through a bluestone bath once each week during March, and occasionally during early winter if the yards were dry. Footrot is a definite problem, and I feel that the few cases of ante-partum paralysis are brought on by the fact that the ewes have footrot and will not graze freely.

Each year the rams have been examined by a veterinary surgeon for epididymitis with the resulting loss of two or three rams per season. During March the rams were put on to a good paddock but were given no supplementary feed.


LAYOUT OF FARM 1949
5
24 ac.
4
16 ac.
3
20 ac.
2
18 ac.
1
20 ac.
5
ac.
Homestead
Implements
Sheep Yards
& Shed
11
5 ac.
6
16 ac.
7
24 ac.
8
16 ac.
9
20 ac.
10
16 ac.
Area 204 acres
N


SUBDIVISION PROGRAMME
TO BE COMPLETED 1956
9
12 ac.
8
12 ac.
7
16 ac.
6
14 ac.
5
14 ac.
4
14 ac.
2
11 ac.
3
9 ac.
1
5 ac.
Farm Lane
10
16 ac.
11
14 ac.
12
14 ac.
13
14 ac.
14
10 ac.
17
5 ac.
5
ac.
15
10 ac.
16
16 ac.
Invercargill — Queenstown Road

It has always been my consideration that next to actual lambing the most important operation is that of flushing. From the time the lambs are weaned the farm is organised for the making possible of a complete and thorough flushing of the ewes. Flushing began three weeks before tupping. The flock was divided into three mobs, two groups of 300 older ewes and one of 200 two tooths. It is the practice to re-raddle the rams every five days and to draft out those ewes which have been tupped. Tupped ewes are placed on lower grade feed with one ram per 100 as against the initial allocation of one ram for 50. The rams are left with the ewes throughout the winter until the ewes begin to lamb. The ewes which lamb late, however, are culled.

From the beginning of May the ewes were run together as one flock and were rotationally grazed over the farm. The three high producing paddocks which were to produce the early spring grass, were grazed very lightly until June 1. On June 21, the ewes were break-fed on swedes, the breaks being approximately two acres each and were fenced by a two-wire electric fence. The run-off paddock was 20 acres and the ewes were shut on this paddock from 4 p.m. till 9 a.m. They were fed roughly eight bales of hay per day. On July 28, when the ewes had consumed seven acres of swedes, grass feeding began. The feeding of the grass diet was carried out in the following fashion: each paddock to be fed was broken in two with a cyclone fence and again in quarters by the electric fence, each break being four or five acres. For the first day on each break the ewes were given two hours, the second day five hours and the third day the complete 24 hours. The ewes spent the remaining hours of the first two days on the break just grazed. In this way the fertility was returned to the portion of the paddock from which it had come. I did fear that the ewes were not getting adequate exercise, but from the death rate and the condition of the ewes, they apparently came to no harm. At no stage did the ewes break through the electric fence, and even on the third day when the break was getting bare and lush H1 and perennial ryegrass were in the next break, the ewes were not tempted to trespass through the wire.

Each year I have employed a shepherd to assist me with lambing. I consider the wages expended are very easily recouped with the services of a good man. The ewes were lambed in one mob, the shedding method being employed. I have often given consideration to the segregating of twins and singles, but could never decide which paddock should have either. During a wet season I find that the light part of my farm produces the best lambs and vice versa. It is too early to decide in September what the season is going to be and consequently where to place the twin lambs. However, now that I am reaching a stage of heavier stocking, I will be forced into a decision as it is my desire to start drafting as soon as the freezing works are prepared to accept lambs.

As a result of experience I use a knife for tailing and rubbers for the testicles. The mortality rate in this season directly related to docking would be half per cent.

A thousand and fifteen lambs were tailed, which gives a lambing percentage of 126 per cent. This was one of my poorer lambing percentages and is directly attributable to the lambing of the two tooths. I found they produced something like 20 per cent. fewer lambs than I expected. Over-feeding in the last six weeks of pregnancy produced a lamb that was too large to survive birth. It was quite common in the morning to find that six two tooths had lambed, three with twins all perfectly well, three with singles, all three lambs dead. It may be of interest to state that 175 lambs were born dead or died during the weeks of lambing.

From lambing until December 18 the paddocks were set stocked. The paddocks which I had sown down carried six or seven ewes and their lambs per acre, whereas in the old dogstail pasture the capacity was as low as four ewes per acre. Given the right season the lambs from the low producing pastures are often the best produced, but this does not compensate for their low carrying capacity. On December 18 three paddocks were drafted and weaned: the weaned lambs placed on the new grass which had been sown in October and the ewes shut into one of the three paddocks. On December 30 the flocks on the remainder of the farm were drafted and the lambs weaned. Space at the freezing works was limited so only 65 lambs could be killed. The remaining lambs were given the pick of the farm. Two paddocks were set aside for grazing the ewes. On January 15 the lambs were drafted, those remaining were crutched and drenched with bluestone, nicotine and cobalt.

The ewes were shorn during the week ending January 14. Each ewe produced a little better than 13 lb of wool, that is including crutchings. When I took over the farm it was the practice to shear early in November, but I found with heavy lambing percentages, no matter what care I took I mis-mothered a number of lambs. When I found my lamb weights were getting worse instead of better some drastic measures had to be taken, so along with the introduction of cattle and cobalt I changed the date of shearing to mid-January. Whether this has been advantageous or not I do not know, but as the lamb weights have gradually improved, I have found it expedient to carry on this practice.

Lambs not picked for the freezing works continued to have the grazing rights over the majority of the farm. During this period I test weighed a number of lambs alternating their grazing from young predominantly H1 pasture to older clover predominant pasture. It was remarkable to me the results revealed. I found that a substantial weight gain was made on the clover pasture after all periods of grazing, whereas after the periods of grazing on the young H1 pasture little or no advance was made in the weight of the lambs, and after one ten-day period three of the tested lambs had actually lost weight. By the end of March 960 lambs had been killed at the freezing works, the average weight being slightly better than 35lb, all of which were either drafted from the mothers or grass fed. The remaining 40 lambs were fed on chou moellier.

The ewes were culled at the beginning of February, culling being done primarily because of the condition of the teeth. Seldom is it necessary to cull a sound mouth ewe because of poor constitution or footrot. During the shearing, ewes with poor fleeces and defective udders are marked, and it is therefore unnecessary when mouthing the ewes to give consideration to these defects, as they have already been branded as "outers." Until the present season it has been necessary to replace something like 20 to 25 per cent. of the flock each year. The death rate and wastage of ewes has been a consistent five per cent. up until last year, when with the grass feeding extended over the full six weeks before lambing, a decrease of one per cent. was made.

Management of ewe lambs

In March, 1954, 306 ewe lambs were purchased. They were medium quality sheep shifted from high country. After the culling of wether and parrot-mouth lambs, the flock wintered was the exact 300. They were crutched and drenched with phenothiazine and given the run of 40 acres of pasture. At the beginning of May they were vaccinated with blackleg vaccine and drenched with Calciferol and then placed on swedes. The swedes were break fed using an electric

fence, the ewe lambs having freedom of movement from the run-off of 18 acres to the break at all times. On August 1 the hoggets were shut on the swedes in the anticipation of the run-off being used for ewes with lambs in September. During August and September they were given a supplementary feed of meadow hay. By the beginning of October these sheep had eaten six acres of swedes. From October until January, they were run on a 20 acre paddock, the paddock being divided in two by a cyclone fence and the sheep grazed rotationally. They were shorn in late October and shore something like nine and a half pounds of wool per sheep. In January, 50 of the poorest two tooths were culled and sold and I was left with 247 as replacements for my own flock. The death rate was one per cent. I am not carrying ewe lambs this year, as I have come to the conclusion that the two tooths must be kept on a lower plane than the ewes in an endeavour to control over-fatness. Moreover, I have not sufficient labour to manage a third mob, though in time I shall be in a position to do so.

Cultivation and topdressing programme

As with the management of sheep this programme has been modified and changed over the last six years, my financial position being a strong influencing factor. Initially the cultivation was carried out primarily for the provision of winter feed, but in the last three years greater emphasis has been placed on the more rapid replacement of run-out pastures, and, given good prices for our produce, this programme will be accelerated further. In actual fact, I have replaced only 80 acres of pasture, relying as much on a better topdressing programme and management to enable the farm to increase its carrying capacity.

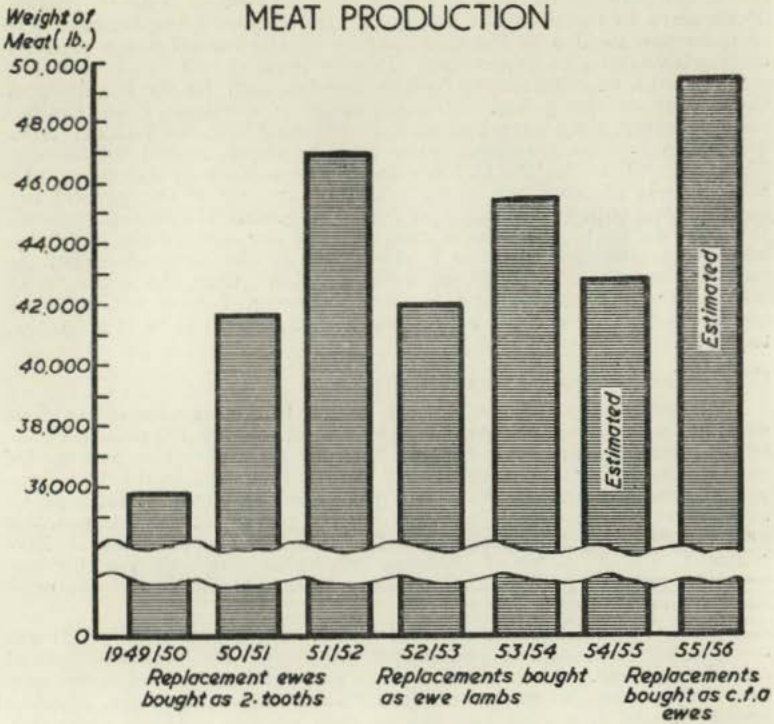
This season I have sown 16 acres of ridged chou moellier. It was sown at the rate of two pounds per acre with five hundredweight of mixed fertiliser. The chou moellier on eight acres had followed a crop of swedes. Unfortunately, in that crop of swedes, clubroot appeared and therefore the second part of the paddock which had been ploughed from lea was also sown in chou moellier departing from my usual practice of swedes, chou moellier and pasture.

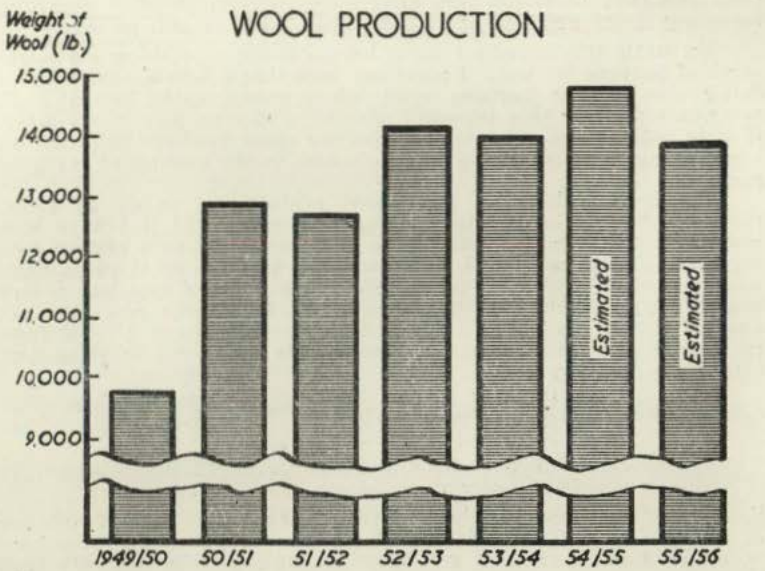
Up until this season I have been cutting something like eight acres of pasture for hay. I must say here that I have always disliked doing this as the pasture, even when subsequently treated well, deteriorated. For this reason I planted a lucerne plot of six acres. If it is not a success I intend to pursue other methods of producing hay for my flock before having to revert to the cutting of my good pastures.

The sowing down of permanent pastures is, as we all know, the very foundation of our grassland farming, and if I have been careless in other tasks in the farm management, I have always done my best to produce a good paddock. The first two or three pastures were sown down with broadcast rape, but I found this had a very definite detrimental effect on the pasture. I am quite sure I can get equally good lambs from grass and clover pastures as I could from the young grass and rape. At present the mixture I consider most suitable is as follows:

Certified Mother H1 ryegrass ..	20 lb
Certified P.P. ryegrass	10 lb
Certified pedigree white clover ..	5 lb
Certified cocksfoot	2 lb
S48 timothy	3 lb

Sown with five hundredweight of fertiliser and two tons of lime per acre. The P. & G. certificates of all grasses purchased have been examined with particular reference to high germination. Perhaps


MEAT PRODUCTION
Weight of Meat (lb.)
50,000
48,000
46,000
44,000
42,000
40,000
38,000
36,000
0
Estimated
Estimated
1949/50
50/51
51/52
52/53
53/54
54/55
55/56
Replacement ewes bought as 2-tooths
Replacements bought as ewe lambs
Replacements bought as c.f.a ewes


WOOL PRODUCTION
Weight of Wool (lb.)
15,000
14,000
13,000
12,000
11,000
10,000
9,000
Estimated
Estimated
1949/50
50/51
51/52
52/53
53/54
54/55
55/56

mention should be made here that I have sown pasture out of pasture. The paddocks concerned being grazed until early January when they have been ploughed and resown, the young grass being used at the latter part of the tupping period.

Early in 1950 when soil testing was first being made use of in Southland, I had two paddocks analysed. The results indicated that the farm required small quantities of lime, and was very low in phosphate and potash. I must state at this stage that this analysis was treated by my neighbours and myself with some scepticism, specially where the pH factor was concerned, and it is only in the last year or so that I have begun to treat the analysis with the respect it deserved. When I first began to prepare this paper, I felt the time was opportune for a second analysis to be made. The results of this analysis show that the pH factor has reached the required level but that further dressings of phosphate and potash are still required. It can be said without going into too much detail that the topdressing programme has been two hundredweight of phosphatic fertiliser per acre per year and one ton of lime per acre every second year. Potash has been distributed in the form of potassic super. During the last two years a cobalt deficiency became evident, so in each of those two years I sprayed the complete farm with five ounces of cobalt sulphate per acre. This is done in November in conjunction with hormone weed spraying. The hormone weed spraying, however, is done on only half the pastures annually.

In conclusion I would like to emphasise that those factors which have assisted me to increase production will make possible further substantial increases and I should like to prophesy that in 15 years all our heavier Southland land will carry seven to eight ewes or the equivalent per acre.

DISCUSSION ON THREE PRECEDING PAPERS

Mr Pilbrow, Mid-Canterbury: I often wonder if Canterbury's inferiority complex about Southland is justified. Southland is carrying six sheep to the acre which is very good, but how does this compare with four sheep and small seeds and crops in Canterbury? What does Southland anticipate to be its ultimate carrying capacity?

Mr Palmer: I can make no comparison, primarily because I have no experience with small seeds. Southland has only been interested in high production during the last 15 years. In another 15 years we should reach eight sheep per acre. Acre for acre we will keep level with Canterbury!

Mr Fahey, South Otago: Why does Mr Palmer wean his lambs so early? Surely it is usual to shear the ewes first and wean the lambs later—not vice versa?

Mr Palmer: We followed the advice of the scientists and are well satisfied with the results. This year we shall wean all of them in mid-December. The weaned lambs gained weight just as quickly as the unweaned ones. It will help us increase our carrying capacity. In our district we are short of feed in November-December and the ewes compete with the lambs for pasture. The ewes can be put on the poorer pasture and the lambs have the best to themselves.

Mr Ward, Meat and Wool Boards' Economic Service: I was interested in Mr Henderson's figures of his lamb draft. It needs a fair amount of skill to get 131 per cent. away. How does he do it?

Mr Henderson: That is difficult to answer. The only thing that I can put it down to is the fact that our sheep are always in a very healthy good condition. At weaning, 40 per cent. go fat off the mothers and the rest get the best pasture available. The ewes go out on the poorer pastures. I think the fact that the death rate

is very low and that everything goes off the farm fat is an indication of the very healthy condition of the flock.

Mr Butcher, North Canterbury: In Canterbury we have experienced an increase in the incidence of blackleg and similar complaints when feeding on turnips and swedes. Have any of the speakers experienced this, and what precautions do they take?

Mr Palmer: We definitely do suffer from blackleg infection, but by making full use of the blackleg vaccine losses are now almost negligible. The hogget losses were fantastically high. The use of Calciferol and careful management to keep them growing has no doubt helped to reduce mortality in the latter.

Mr Henderson: I have never inoculated either ewes or lambs for blackleg, pulpy kidney or any other diseases. Losses from blackleg are approximately nil. I do take the precaution of preventing the ewes lambing under the trees where the number of microbes can be expected to be very high. We erect a cyclone fence to keep the ewes well out and I am sure this cuts down lambing infections quite considerably.

Mr Bews, North Otago: Presumably Mr Palmer does all his own work whereas Mr Pilbrow employs a married couple (and anticipates employing another) and casual labour. How do the speakers account for this?

Mr Pilbrow: Mr Palmer has not been farming for so long as I have and he is probably still doing slightly more than is possible! I have always maintained that the time factor is all important in a high production programme. I like to have good labour and do the work at the opportune time. Also, I feel that many jobs such as topdressing can be better done ourselves rather than by contractors. We are always flat out! In off months there are jobs such as making concrete posts; fencing is much cheaper if you make the concrete posts yourself.

Mr Palmer: I would like to employ a married couple but the finances will not stand it at present. As soon as I achieve seven ewes per acre it will be a working unit for two homes. At present I employ contractors for certain jobs such as liming, fencing and crutching.

Mr Whittlestone, Otago: Mr Palmer shore in early January. What are his views on pre-lambing shearing?

Mr Palmer: It is out of my scope at present. I am too far south and have insufficient shelter. I believe I do get beneficial results from the present system of shearing after weaning rather than shearing when the lambs are at foot.

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3. THE SHEEP FARM ON THE EXPERIMENTAL AREA OF THE WINCHMORE IRRIGATION FARM

Mr G. K. McPherson, Department of Agriculture.

In 1949 a trial was commenced on a 27-acre block of land at the Winchmore Irrigation Research Station to determine the potential fat lamb production from irrigated pasture. The soil type is known as the "Lismore Shallow Silt Loam" and is typical of what is commonly referred to as light plains country. It consists of approximately 14 inches of soil and subsoil overlying gravel. The average rainfall is approximately 30 inches.

The land was prepared for irrigation under the border dyke

system in the spring of 1948, and the whole area was sown to permanent pasture in March, 1949, with the following seed mixture:

Perennial ryegrass	15 lb
Short rotation ryegrass	15 lb
Cocksfoot	5 lb
Crested dogstail	1 lb
Montgomery red clover	2 lb
White clover	2 lb
Subterranean clover	2 lb
	42 lb per acre

Two tons of lime per acre were sown on the cultivated ground and the area also received two hundredweight super per acre broadcast prior to sowing the seed. Two hundredweight of super per acre has been applied annually, originally as one application in the autumn but latterly as two applications, each of one hundredweight, in spring and autumn. Nitrolime has been tried several times but owing to lack of visible response has not become general practice. The area was subdivided into nine paddocks until last year when two paddocks were further subdivided, making a total of 11 paddocks of from two to three acres each.

There has been no restriction on the amount of water used for irrigation. Pastures have been irrigated whenever it was considered —from the appearance of the sward—that they would respond to water. In a wet season this has meant approximately three applications of water to each paddock and in a very dry season up to approximately ten applications, each application amounting to three or four inches of water.

Originally, the flock consisted of a mixture of fine-woolled and coarse woolled ewes, but today the ewes vary from a three-quarter bred Romney to almost a pure Romney. Apart from the use of one Border Leicester ram in the 1954-55 season, only Southdown rams have been used in the trial. In the early stages of the trial no definite culling system was adopted. Since 1952, however, the practice has been to cull approximately one-fifth of the flock each year and replace the culled ewes with two tooth ewes in the autumn.

The trial commenced in the winter of 1949 when 90 two tooth ewes were put on the trial area. Ewe numbers increased each year until over the past three seasons seven ewes per acre or a total of 189 ewes have been carried. The following table shows the number of ewes carried and the lambing percentage:

Year	Ewes per acre	Lambing Percentage
1949-50	3.3	105
1950-51	4.4	120
1951-52	6.6	123
1952-53	7.0	124
1953-54	7.0	115
1954-55	7.0	116

In general the health of the ewes has been good. The highest death rate occurred in the 1952-53 and the 1954-55 seasons, when 3.7 per cent. of the ewes died. It has been the policy to drench the ewes with phenothiazine once a year usually about mid-October.

The trial area is really a small self-contained grass farm. No cropping is done, the stock being carried throughout the year on grass and the products of grass, i.e., hay or silage. Silage, approximately 20 tons, was made in one year only. It has been the practice each year, however, to cut six or seven acre for hay. This has yielded 250-350 bales annually which is sufficient to winter the ewe flock and also to meet the requirements of the lambs. The making of hay extends from November to March. Up till 1952, hay ruined by

adverse weather was replaced. For the past three seasons, however, the unit has been completely self-contained.

Throughout the period of the trial the ewes have been wintered on wintersaved grass plus hay. Grass produced in the autumn is carried over into the winter and is then break fed to the ewes in exactly the same way as many farmers break feed turnips. The aim has been to have approximately half the trial area available in wintersaved grass at the beginning of the winter. Fed at the rate of two hours per day, one acre of good wintersaved grass lasts 189 ewes for approximately one week. In addition to this saved grass, approximately two bales of hay is fed daily.

Lambing usually commences about 20th August, and is practically completed by the middle of September. In the early years of the trial the ewes and lambs were run in one mob and rotated around the various paddocks. Later on—as the number of ewes increased—the ewes were split into two mobs at lambing, each mob having the run of several paddocks. During the last two years a portion of the flock has been set stocked, and the remainder rotationally grazed. It should be remembered that in recent years approximately three acres are reserved for hay. This means that 24 acres have to carry 189 ewes and their lambs till about the middle of December—a stocking rate of approximately eight ewes and their lambs per acre. There is a suggestion that the set stocked lambs do better than those rotationally grazed but in view of the heavy stocking rate it is doubtful if it would be advisable to attempt set stocking over the whole of the available grazing area. Lamb deaths have not been unusually high. In the wet season—1952-53—a death rate of 5.1 per cent. was recorded. The average death rate has not exceeded three per cent.

Weaning of lambs usually takes place in late December or early January. The weaned lambs are generally divided into two mobs and returned to pastures which have been spelled for a fortnight or so. The general aim is to irrigate the paddocks and then allow the growth to develop and harden before it is grazed, so set stocking of lambs cannot be practised and each mob is rotated around two or three paddocks. From weaning onwards lambs have access to hay fed from racks.

When the number of ewes was less than five per acre, lamb fattening presented no problems. More than half the lambs were drafted fat off the mothers and the balance fattened readily on grass. When the ewe numbers increased to seven per acre the percentage fat off the mothers decreased substantially and the time taken to fatten the weaned lambs increased substantially. Lambs weaned in early January did not make much progress for a month or so. Most of the lambs went off as "fats" from late February to April and some years a few lambs were still left into May. Regular drenching of the lambs was tried, particularly in the wetter years, but it is not known to what extent this improved the rate of fattening. Nevertheless it has been possible to fatten the lambs with 80 per cent. or more graded prime even if the rate of fattening is slow and still maintain the ewe flock on the area. The following table gives details of all lambs sold off the trial area during the past six seasons:

Year	Ewes per acre	Lambs off mothers %	Prime Lambs %	Seconds %	Culls %	Av. Wt. Lambs lb
1949-50	3.3	67	100	0	0	33.3
1950-51	4.4	56	100	0	0	37.0
1951-52	6.6	20	89	1.1	0	32.0
1952-53	7.0	0	80	11.5	8.5	31.4
1953-54	7.0	21	86	14	0	32.0
1954-55	7.0	27	83	16	1.0	32.5

A record has been kept of the weight of wool produced each year. In some years a percentage of the clip has consisted of cotted wool, but other quality factors are unknown. The following table shows the increase in production of lamb meat and wool:

Season	Ewes per acre	Total Lamb Meat lb	Lamb Meat per acre lb	Total Wool lb	Wool per ewe	Wool per acre	Wool growth months
1949-50	3.3	3130	116	1268	14.1	47	15
1950-51	4.4	5260	195	998	8.3	37	11
1951-52	6.6	6975	258	1890	10.5	70	12
1952-53	7.0	6799	252	2038	10.8	75	13
1953-54	7.0	6816	252	1692	8.9	63	11
1954-55	7.0	6962	257	1968	10.4	72	12

While it is considered that the comprehensive grass mixture sown has contributed in no small measure to the relative success of the trial, the pastures today are mainly perennial ryegrass, dogstail, white clover dominant. It would appear that the heavy stocking rate per acre has reduced the amount of short rotation ryegrass, cocksfoot and Montgomery red clover in the sward despite fertility build-up, and thereby has lowered the yields of hay from cuts taken in February and March.

It is intended to repeat the present experiment on an area of 150 acres. This new trial will determine whether the system of fat lamb and wool production described in this paper is a practical farming proposition.

DISCUSSION

Mr Hunt, Chairman: Was timothy left out of the seeds mixture for any specific reason?

Mr McPherson: When the trials started we knew very little about the behaviour of grasses under irrigation. The actual mixture used was just a shot in the dark. Recently we have included timothy. I cannot say I am altogether happy with its performance on our soil type under irrigation. Even under dairying conditions it has not provided much feed. In the low lying areas where the water lies there is more timothy but it has not done sufficiently well to warrant its inclusion in a sheep grazing mixture.

Mr Fahey, South Otago: What would be the cost of the water per acre?

Mr McPherson: In dry seasons we irrigate the farm ten times, which means approximately three feet of water. The present cost at Winchmore is 4/- per acre foot or 12/- for three feet.

Mr Lister, South Canterbury: What is the approximate cost of laying out border dyking?

Mr McPherson: Costs increase yearly. Between 1948-51 Winchmore border dyked 310 acres out of 350 acres and the average cost worked out at £5/18/- per acre, including the culverts, head gates and so on. On the other hand another paddock was border dyked last spring and it cost approximately £7 simply for the border dyking—but it was an uneven paddock.

Mr Scott, Mid-Canterbury: You only irrigated three times in the abnormally wet season of 1952-53. Was this on account of the excessive rain or because of worm infestation?

Mr McPherson: In a wet season the lambs are dosed several times with phenothiazine but we are not sure how much good this does. On many occasions when the lambs were not doing as well as they might, samples were sent to Wallaceville and invariably the worm count was low. We still dose with phenothiazine as a precaution.

Mr McCracken, North Canterbury: What happened to the two pounds of subterranean clover mentioned in the mixture?

Mr McPherson: We have seen very little of it. Such a mat of red and white clover formed that the subterranean clover did not have a chance. The only subterranean clover that I have seen under irrigation is in those paddocks which were established with subterranean clover prior to irrigation.

OPEN FORUM

Dr Burns: I have been approached by the dairy farmers about the possibility of including subjects for dairy farmers, either as a separate conference or in addition to this Conference. The general feeling of the Committee is that it should be included in this Conference, either a day or half day. We recalled that three years ago we put in a dairy section and, as a lot of non-dairy farmers were disinterested, it was poorly attended. Perhaps we could invite a controversial speaker to open the section with a subject relating to dairy and beef production?

Mr A. C. Hurst, Papakaio:

New Zealand Farm Apprentices (Inc.)

At the present time the source for our farm labour is farmers' sons, but with increased production much more labour is desirable. The intake of boys from the schools to the farm is too low owing to the competition of the town in attractive high wages and amenities of all kinds, while we can attract only those boys who have a natural love of the land and stock. But there are many more lads who could and would develop this love of land and stock if they were given encouragement, and it is our job as farmers to provide these opportunities. The future success of farming depends on a continuing supply of young men.

The objects of the Society are: To attract the best type of school pupils on to the land and to ensure their adequate training in theory and practical farm work and animal husbandry; to encourage the ambitious youth to go on with his farm training to secure a Diploma in Agriculture or higher degree; to maintain and improve the standard of farm work and thereby secure economic increased primary production; to ensure the better type of farmer obtains the best type of employee; to secure public recognition of the high skill required from a trained farm worker; and to arrange contracts of apprenticeship to suit individual requirements. This Society is a purely voluntary organisation, but will be run as closely as possible in parallel with other apprenticeships in skilled trades which are today operating under the Apprentices Act 1948.

May I emphasise the following points:

(a) This scheme is *not* designed to provide cheap labour to the farmer, but to place at his disposal efficient labour, at not more than he would have to pay for inefficient labour.

(b) This efficient labour will be trained exactly to the standard that the farmer himself wishes and to his own standard of efficiency.

(c) The Committee will see that the trainee is of the good type who wants to learn and become efficient as fast as possible.

(d) In return, the Committee will see that the farmer himself actually lives up to the standard that he undertakes to teach, when he signs up his contract.

(e) Any farmer who cannot see that it is in his own interests to employ efficient instead of inefficient labour, will not be interested in this scheme; nor will any farmer who cannot recognise that it will pay him to show his own worker how to become efficient. Such farmer will receive little sympathy from his fellow farmers if he becomes short of labour.

(f) This scheme is designed to benefit both employer and trainee and will not cost the general taxpayer anything, but the whole community must inevitably benefit.

(g) In New Zealand's economic life, both industry and commerce will pine or thrive in company with that of our primary production and I suggest that with our progress in the latter we can look back with pride and forward with confidence.

This Farming Apprenticeship Scheme can be likened to Shakespeare's quality of mercy: "It is twice blest; it blesses him that gives and him that takes."

Mr Hunt, Chairman: Who are on the Committee that run the apprenticeship system?

Mr Hurst: The Committee comprises three farmers (representing employers), three members of the Young Farmers' Club (representing employees), District Fields Officer (Technical Advisor), and the District Officer of the Department of Labour. If you write to Mr Finch of Oamaru he will send you full particulars. We would like to see local committees throughout New Zealand and anyone interested is urged to start a group.

CLOSING REMARKS

Dr Burns: This Conference is the first to be held in this hall. We realise there is some difficulty in the ticket system which was adopted for the simple reason that it gave us some indication of the numbers attending. This information is necessary for the organisation of the conference. There is no limit on the attendance up to 700 or 800 daily provided we know sufficiently far in advance to be able to cater for them. However, there is a definite limit to the number of people for whom we can provide accommodation.

This hall was not designed as a conference hall and we know the accoustics are bad, but next year we should have installed an improved loud speak and microphone system.

Particular thanks are due to the members of the Committee and your Chairman who have had a tough job and have done it superbly. Also, on behalf of the College, I would like to express to the residential people, and particularly Mr Bowmar, our very sincere thanks for their willing assistance at all times. Lastly, I would like to express to all, our great pleasure in having such an enthusiastic group of farmers at the College.

Chairman: We have now come to the end of an excellent Conference. Dr Burns has very kindly thanked the Committee, saying that we did an immense amount of work, but I would like to take the liberty of contradicting Dr Burns here in saying that the work of this Conference was largely done by the staff of the College. We helped all we could. I should also like to thank the Press and Broadcasting Service for their help at this Conference.

You have heard very interesting papers; Mr Bethell with his philosophical approach, Mr Topp with his enthusiasm, Mr Urquhart who has shown you what can be done to meet special problems, and Mr McPherson who has told you what can be done by planning. I do wish to thank you for your co-operation and help, and look forward to seeing you back again next year in ever increasing numbers.

Mr J. H. Grigg: Mr Chairman, on behalf of the Committee and all farmers attending this Conference, I would like to tell you how very much we appreciate the excellent way you have ruled this meeting and thank you very much indeed for your very good work.

The following suggestions were made for inclusion in the next Conference:

(a) Dairy Husbandry, and matters of common interest for beef and crop husbandry.

(b) The use of organic and inorganic fertilisers.

(c) The merits and demerits of rotational grazing against set stocking.

(d) Half day for inspection of the College farm, Ashley Dene, Crop Research Division, and research projects.

(e) Written questions, submitted for the preparation of an answer, should be dealt with at the Open Forum by a panel of experts nominated at the commencement of the Conference.

(f) That a higher percentage of the papers should be of a technical nature.